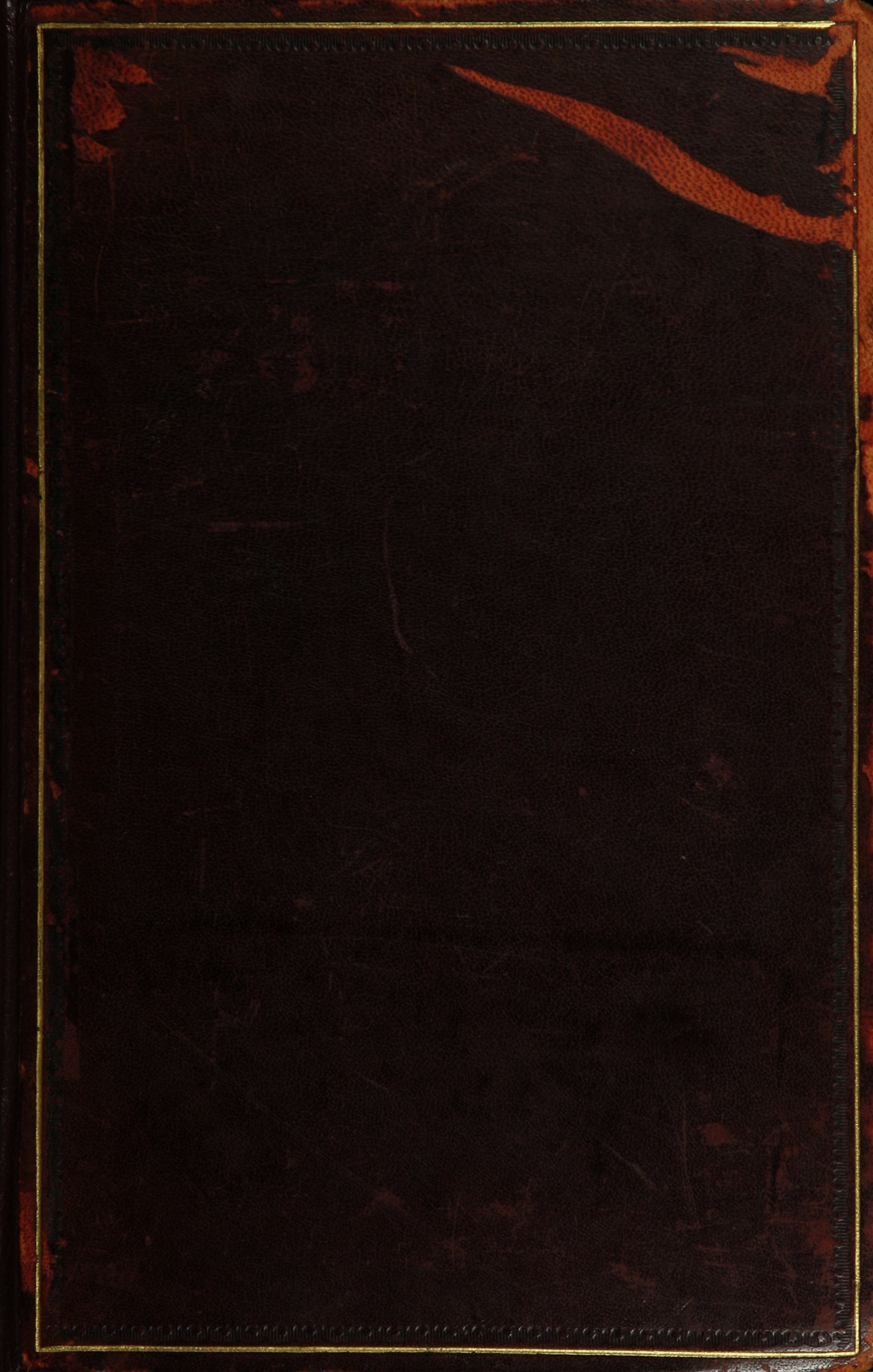
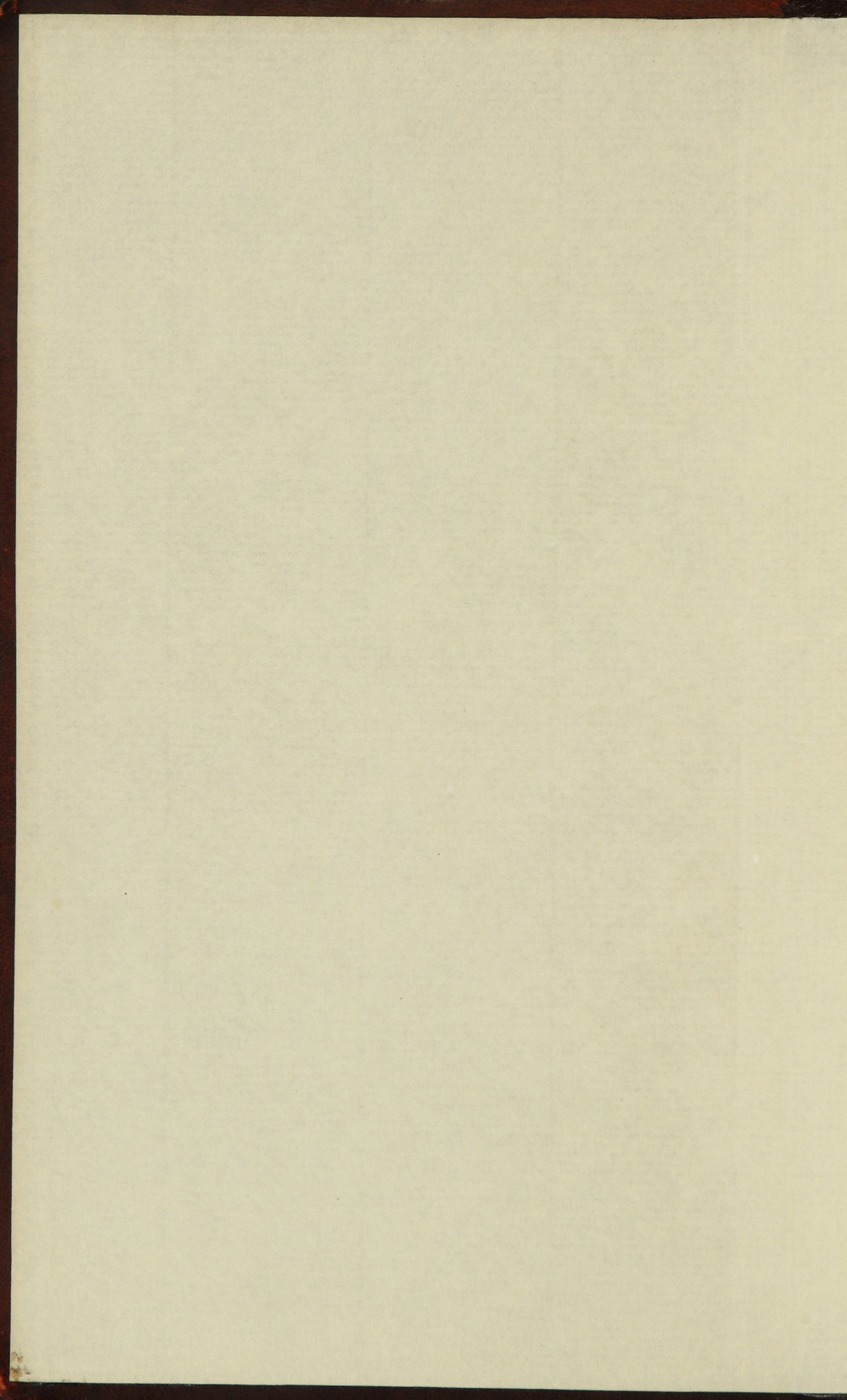








W. H. Palmer

COLONIAL AND INDIAN EXHIBITION, LONDON, 1886.

QUEENSLAND: ITS RESOURCES AND INSTITUTIONS.

ESSAYS;

PREPARED BY THE AUTHORITY OF THE

EXECUTIVE COMMISSIONERS IN QUEENSLAND:

THE HON. A. C. GREGORY, C.M.G., M.L.C., ETC., CHAIRMAN.

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1886.

PREFACE.

IN publishing these Essays in conjunction with the Catalogues of Exhibits from the Colony of Queensland in the Colonial and Indian Exhibition of 1886, the Executive Commissioners appointed by the Queensland Government consider they have adopted the best method possible at their command in order to bring under the notice of the general public the resources, industries, social and physical features, and prospects of the colony. Each essay is written by a specialist in his own department of knowledge; and the names of the writers are so well known in the colony as to give sufficient guarantee for the reliability of their respective writings. The subject-matter has also been carefully checked by the editor, whose long and varied experience of Australian life peculiarly fits him to detect any inaccuracies of statement.

Owing to the absence in Queensland of a State Agricultural Department, from which could have been obtained all the information relative to the land, and also owing to their being no Museum of Mines, from the stores of which could have been obtained all the histories and facts relative to the numerous mining districts and industries of the colony, the Commissioners have been entirely thrown upon their own resources in making this collection. However, by the assistance of the local committees which they appointed in every important town, they have succeeded in gathering together a thoroughly representative and fairly numerous collection of the very varied products and industries of Queensland.

A careful study of these exhibits will show to the scientific man, or to the manufacturer, or to the merchant, or to others, that although the colony is but in its infancy, the resources and products already discovered are extraordinarily varied, thus pointing towards a future of marvellous greatness. Indeed, one glance at the Court will show that it cannot be otherwise; for there will be seen produce of the

most diverse climes and soils, proving the capabilities of the colony to be equal to producing any known agricultural product of the earth. All the minerals in common use by manufacturers are to be found in their crude state represented among the exhibits, and there are, besides, many of the rarer, but at present less useful, metals; then, again, the samples of the precious metals (such as gold, silver, and copper) are so rich, and are from so many widely-extended but separate districts, that it can safely be presumed these stores are inexhaustible.

The Essays on Agriculture, Horticulture, the Pastoral Interests, and Sugar Industry, treat fully of their respective subjects and point out in detail how these industries are conducted in the colony; as also do the Essays on Minerals and the Catalogue of Minerals. The Essay on Commerce shows how elastic and expansive are our commercial industries and mercantile companies, for in every instance of success mentioned the beginnings have been small and unimportant, but, forced on by the sheer growth of the colony, have now assumed even gigantic proportions. The social features of our community are well set forth in the Introductory Essay and in that on Education. The scientist will find a mine of novelty in the Essays on the Flora, on the Geology, and on the Pharmaceutical products; and the naturalist, much that is interesting in the brief paper upon the Natural History of Queensland. The Commissioners hope that these papers, if distributed among the working men who are inclined to emigrate, will induce many to come to Queensland; such immigrants will find some good counsel, and also some capital hints as to what colonial life in "the bush" (or back settlements) is like, in the Essay entitled "Hints to Immigrants."

The Collection of Indigenous Woods shown in the Court, though embracing nearly 500 distinct varieties, is so far beyond what it is possible to obtain as indigenous from any other of the Australian colonies, that it proves from this source alone there is a certainty of great future commercial results. When it is considered that this large collection represents only about one-third of the known woods of the colony, the Commissioners feel justified in particularly requesting the attention of those interested to them, for, although not

complete, yet the collection well represents the peculiar characteristics of the woods of the country, and among them may be found the particular kind required for any manufacture or manipulation. The form in which they have been prepared for exhibition renders such examination easy.

To all people who may be meditating emigration from the motherland, the study of these papers and the Catalogue of Exhibits, in connection with the exhibits themselves, is earnestly suggested, for it affords a complete detailed guide as to the capabilities, resources, and productions of this extensive, healthy, and fertile colony of Queensland; and it will also show them the state of society here, and how rapidly we are progressing in developing the resources around us, and towards becoming a great nation.

THE EDITOR.

Brisbane, March 1st, 1886.

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QUEENSLAND:

AN INTRODUCTORY ESSAY

BY

A. J. BOYD.

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QUEENSLAND:

AN

INTRODUCTORY ESSAY,

By A. J. BOYD.

DISCOVERY AND SETTLEMENT.

SIXTY-TWO years ago Lieutenant Oxley, Surveyor-General of New South Wales, gazed first upon the primeval solitudes through which flowed the magnificent river to which the explorer gave the name of Brisbane. No longer was the silent shore to be abandoned to the aboriginal and to the denizens of moor, marsh, and forest. Thus the foundation of Queensland's greatness was laid when Oxley planted his foot on the sand of Moreton Bay.

“*Multa quoque passus dum urbs conderetur.*”

It will serve no purpose to rake up in this paper the old stories of suffering, crime, and stern retribution which characterised the early settlement of the colony. Suffice it to say, that, in 1825, a penal settlement was founded at the mouth of the river, and the convict gloom hung over these fair shores, tainting the atmosphere, repelling and retarding settlement until 1839, when the last batch of convicts was landed here. Ten years later the first free immigrants arrived and settled down in what was then the bush—now a crowded suburb of Brisbane—and to which they gave a name which perpetuates the memory of the good ship which brought them, with their *lares* and *penates*, to seek a new home in the new Land of Promise. All Queenslanders have heard of Fortitude Valley—the chosen settlement of the free pioneers of civilization in the colony.

It was not until 1859, however, that the Colony of Queensland was proclaimed by Imperial command, although the first Governor, Sir George Ferguson Bowen, had arrived in 1857. From this point may be dated its true progress.

Although Queensland has an area of 678,600 square miles, with a sea-board of about 2,500 miles, the traveller would observe with surprise the extraordinary evidences of the energy of what may be comparatively termed *this* handful of people. On all sides—north, west, south, and east—civilization and vitality are found. The coasts swarm with vessels, from the majestic mail steamer to the humble fishing-boat. Inland, railways hurry rich freights to the coastal towns. Far away in the silent bush, towns have arisen—the country is

parcelled out and fenced off; the boom of the miners' blasting operations; the crash of the quartz-crushing mills; the shrill whirr of the saw; the bleating of millions of sheep; the lowing of hundreds of thousands of cattle; the crack of the teamsters' whips, are heard in all directions. The Great Silent Land is silent no longer. Distance is bridged over—space annihilated. There is no place so distant from the metropolis whence a telegram may not be sent; the post-office is everywhere—the mailman ubiquitous. The face of the land is entirely under the dominion of the Australian. Day by day sees the railways pushed further and further, and in a very short space of time Brisbane will be connected by rail with those great centres of population of the southern colonies—Melbourne and Sydney.

PHYSICAL FEATURES, POPULATION, AND CENTRES OF POPULATION.

Taking a glance at the country in which such rapid strides in civilization, culture, and luxury have been made, it will be seen that Queensland owes its advance in a large measure to its mineral and pastoral resources. The colony appears to be naturally divided into three grand divisions, each eminently adapted to its peculiar industry. Parallel with the eastern coast runs a high range of mountains, distant from 20 to 100 miles from the sea—a continuation, in fact, of the Great Australian Alps and of the Blue Mountains of New South Wales. Between this range and the ocean we find a wide belt of alluvial soil, through which meander many fine rivers and their tributary streams. Beyond the coast range is a vast table-land, with its level or gently-undulating plains stretching away like the vast prairies of America to the illimitable horizon. These three well-defined divisions are each devoted to different industries. The alluvial coast lands are given over entirely to agriculture and to timber-getting. The banks of the rivers were, before the timber-getter and the farmer made their appearance, clothed with a luxuriant growth of timber. For centuries the decay of leaves, of trees, and of succulent plants had been forming layer upon layer of the richest mould. The frequent recurrence of heavy floods assisted the formation by leaving, on their retreat, deep deposits of rich sediment. Within the shadows of these scrubs no grass grew; only stray rays of sun found their way through the tropical luxuriance of the trees, lianas, orchids, &c., which everywhere abounded. But wealth was soon to be drawn from them. The stately Moreton Bay pine-tree, the noble red cedar, and the imperishable beech grew to enormous size on the borders of the rivers. These were soon discovered, and saw-mills sprang up in all directions. The expiring sigh of the last tree as it fell to the lumberer's axe was the signal for the farmer to step in. With axe and brand the jungle was quickly removed, and maize, tobacco, and cotton fields soon added another charm to the already beauteous rivers. Boats and steamers began to ply on the hitherto unploughed waters, and agriculture grew and flourished.

Across the range, which towers to a height of over 3,000 feet, a different sight meets the eye. The basaltic plains of the table-land are covered with a luxurious growth of nutritious grasses. Men, famous in the older colonies amongst sheep and cattle, took possession of the solitary wilds, and behold! the face of the land is to-day dotted with flocks and herds.

In 1858 a new era was heralded in by the discovery of gold in the coast range. At this magic word the third great division resounded with the busy hum of men. Another impetus was given to the colony. Thousands of southern miners, business men, and speculators poured into the colony, and from that day to this the ranges have been the home of a numerous and wealthy mining community.

This brief outline of the early history of the colony is all that the limits of space will permit. That history has gone on repeating itself, and, with a few checks, has been one of continual progress—a progress which, taking into consideration the gloomy circumstances under which the colony was started—its great distance from Europe, and the want of information concerning it—a want felt even at the present day—may be said to have no parallel in the history of British colonization.

Queensland having been thus built up of three great industries, we may now consider what has been the outcome of these. The population, which in 1846 numbered only 2,500 souls, had now reached 25,000, and the tide of immigration has rolled in continuously since that date, until in 1883 the census showed a population of 287,475 persons. Taking the annual increase at 15 per cent., the next census will probably give an estimated population of 400,000. The large centres of population are situated on the banks of navigable rivers.

Brisbane, with a population of about 40,000, is beautifully situated on both banks of the river of the same name, at a distance of about 12 miles from its mouth. It stands in lat. $27^{\circ} 28' 3''$ S., long. $153^{\circ} 6' 15''$ E. On the north side are the principal places of business, the Supreme Court buildings, Government offices, head offices of the banks, the newspaper offices, &c.

The new building of the Queensland National Bank is a most imposing structure of freestone. It has just been completed at a cost of about £40,000, and can scarcely be surpassed, if equalled, in massive elegance by any banking establishment in the old country. Government House is situated in a lovely domain adjoining the Botanical Gardens; but the building is now far too small for the purposes of public ceremonies, balls, levées, &c., and it is therefore proposed to erect a spacious building on the commanding site, part of which is now occupied by a splendid Grammar school.

Extensive saw-mills, factories, iron shipbuilding yards and foundries line the banks of the river on either side. At the numerous wharves may be seen vessels of many countries, taking in and discharging cargo, whilst here and there may be seen a British, German, or French warship moored in the stream. The Brisbane River is one of the most "sea-going" rivers in the Australian colonies. The

largest mail steamers, many of them of 4,000 tons burthen, find no difficulty in coming up with their full cargoes. A commodious dry dock affords ample facilities for effecting repairs to all but the very longest vessels. The dock is to be lengthened, and when this work is completed it will accommodate vessels of all types.

Other large coast towns are—Rockhampton, on the Fitzroy River, with 10,000 inhabitants; Maryborough, on the Mary River, 12,000; Townsville on the Ross and on Cleveland Bay, 10,000; Mackay, on the Pioneer River, with 2,500. This town is the great centre of the sugar industry. About thirty large sugar-mills are here in operation, and the output of sugar reaches 18,000 tons annually. Bowen, Cairns, and Cooktown, on the Northern coast, are towns which have a grand future before them. The two latter are being connected with mining centres inland by rail. Bundaberg and Gladstone are amongst southern coast towns of importance. The former is connected by rail with the copper district of Mount Perry—the latter is a cattle-shipping port.

The numerous inland townships are all rapidly rising in importance. Charters Towers, 100 miles west of Townsville, is marvellously rich in gold quartz reefs, and large sums are invested in the mines and in mining machinery. The great Mount Morgan mine, lately discovered near Rockhampton, is a perfect Aladdin's cave. Near Charters Towers is the silver district of Ravenswood, which is still a wealthy gold-mining town. Gympie, on the Mary River, is the centre of a rich auriferous district; the town is large and populous. Stanthorpe, on the borders of New South Wales and Queensland, is the centre of a tin-mining district; as is Mount Perry of the copper interests. Ipswich, a populous and one of the oldest towns of Queensland, is situated on the Bremer River, 25 miles from Brisbane. The Government Railway workshops are established here. At the present day the town owes its importance to its coalfields, and its manufactures, such as tweeds, woollens, &c. To enumerate all the towns of Queensland would not come within the scope of this pamphlet. Some idea may be gathered of them when it is stated that Government Savings Banks are established in 102 towns; that the Bank of New South Wales has branches in 39 of them; the Queensland National Bank in 41; the Australian Joint Stock Bank in 16; and other banks have also their branches established in various towns.

PASTORAL AND AGRICULTURAL.

Allusion has been made to the boundless and fertile plains of the Western transmontane district. These plains early became famous for their grazing capabilities, and explorers were soon followed by pastoral settlers. Sheep and cattle rapidly covered the face of the land. In 1851 the first wool ship sailed direct from Brisbane to London. The latest statistics show the export of wool to have reached 2,277,858 lbs.; 11,000,000 sheep are now pastured in the colony; 4,000,000 horned cattle; besides a quarter of a million horses. The stock is pastured on large areas of land rented from the Government at the rate of from 15s. to £3 per square mile, and many of these

"runs" as they are termed, consisting of 100 square miles each, are consolidated, so that one squatter may hold as much as five thousand square miles. This sounds large, but when it is considered that except in cases where the squatters have purchased their runs, the cattle wander about in unfenced freedom, looked after by a few stockmen who see that the sufficient herds of cattle keep to their own portion of the run, it will be seen that large areas of land are absolutely necessary, as the cattle depend entirely on the natural grasses, which sometimes fail them in very long droughts. Squatting has, however, of late years been reduced to a science. Cultivation of artificial grasses and irrigation are being largely resorted to, whilst large sums are expended on the importation of pedigree stock. The Australian squatter thinks nothing of paying from £1,000 to £2,000 for a pedigree bull, or from £200 to £600 for a stud sheep. Thus it will be seen that the pastoral industry is one of great magnitude and importance.

Agriculture is carried on very much in the same style as it is in the older colonies or in the old country, with, of course, this difference—that Queensland has more tropical and semi-tropical products than the former.

In new "scrubs" or jungle the beginning of a farm is a very primitive matter. A man and his family settle down generally in a tent, sometimes in a bark hut. He then sets to work with his axe and fells a couple of acres of jungle. Owing to the dry heat of the climate, it is not many weeks before this is ready to be burnt off. A match applied on a windy day will generally make a clean sweep of all but the largest logs. Then all the family take hoes and march across the land, dropping maize seeds in small holes made with the hoe in the rich vegetable mould. No further cultivation is needed. The fire has destroyed the seed of noxious weeds—the rich warm humus generates the seed and stimulates the rapid growth of the plant. Whilst this first crop is growing and hastening towards maturity, the farmer occupies himself with clearing additional land, fencing, &c., and in due course, with fairly showery weather, he reaps a rich harvest of grain. He has a great advantage over the farmer in colder regions—he can take two or even three crops of various kinds from the same ground in one year. And in spite of the constant cropping, the scrub soils of the Brisbane river, which have never had a day's rest, and to which not an ounce of manure has ever been applied, have borne heavy crops of maize, cotton, arrowroot, potatoes, and sugar, not to mention oats and barley, together with a host of vegetables—such as peas, turnips, carrots, cabbages—for over fifteen years, with very little sign of deterioration.

SUGAR.

In 1846 it had been shown by a small experiment that the sugar-cane could be successfully grown in Queensland. Nothing was, however, done on any remunerative scale till the year 1865, when the Government offered special facilities to the colonists to foster the cultivation of sugar.

Without going into the history of the trials, of the failures, and of the now historical sugar which was produced by the late Mr. John Buhôt, a sugar-planter of great experience, by crushing the cane in a copying press, and boiling the sugar in a frying-pan, it will be of interest to note how enormously the sugar-producing interest took hold of the country. In 1867 six mills produced 168 tons of sugar. In 1872 over 6,000 tons were made, and everything looked bright and prosperous for the growing industry, when a terrible disaster befell the planters in 1873.

A disease akin to blight attacked the soft cane, then universally planted under the name of Bourbon cane. In an incredibly short space of time the cane-fields all over the colony were attacked, and the industry appeared to be about to utterly collapse, when it was discovered that certain hard varieties of cane were not susceptible to the disease. These new canes soon replaced the Bourbon, and all went on merrily again. Vast sums have been invested in machinery, lands, and labour, when again trouble has threatened the planter in two forms; one, in the depreciation in the price of the commodity, the other in the labour question. Both these difficulties will, doubtless, be overcome in time, for it is not possible that an industry returning about £1,000,000 per annum will be allowed to lapse when obstacles may be overcome by judicious legislation.

GRAPES AND OTHER SEMI-TROPICAL PRODUCTS.

The grape seems to have found a congenial home in Queensland, and several large vineyards turn out annually considerable quantities of very fair wine. The manufacture of champagne has also been commenced with every prospect of success. Tobacco and arrowroot are largely grown, the climate favouring both these products. The Western plains are principally devoted to the culture of cereals; and the wheat farmers are generally in comfortable circumstances.

GOVERNMENT—LEGISLATIVE, MUNICIPAL, AND JUDICIAL.

The Government of Queensland is modelled upon the plan of the British Constitution, and consists of a Governor appointed by the home authorities, a Legislative Council and a Legislative Assembly. Six responsible Ministers are at the head of the various Government departments. The franchise is almost universal, so that every male of sound mind, who is of the age of twenty-one and possesses an income which any labourer can easily command, has a voice in returning the members to the House of Assembly. The enormous extent of the colony naturally caused discontent to be felt at what was looked upon as "Centralization." Revenue derived from the North was to a great extent expended in the South. To obviate this, the country districts were placed under what is called "*The Divisional Boards Act.*" By this Act no political influence could be brought to bear upon the question of votes for roads, bridges, &c. It divided the colony into seventy-four divisions,

each governed by a locally elected board consisting of from three to nine members. The duties of these boards were to levy rates, and maintain and control all public highways, roads, bridges, ferries, wharves, wells, reservoirs, and other public works. An endowment is paid by the Government to each board, equal to twice the amount raised by rates during the first five years of the operation of the Act, and a sum equal to the rates collected during every subsequent year. The Act had a magical effect upon the country. It worked smoothly almost from the outset. Roads were formed, bridges built; and where formerly the weary farmer or timber-getter flogged his jaded cattle as they floundered through miry tracks or plunged through flooded streams, he now travels gaily along well-metalled and gravelled roads and across substantial bridges or punctual ferries. The divisional boards are in effect a kind of rural municipal council.

The goldfield laws are administered by wardens, who are also police magistrates. The large towns are all erected into municipal councils, and some into shire councils, a distinction without much difference—all tend to the same end and all work successfully.

The administration of the law is in the hands of a chief justice and six other judges, besides whom there are in every large town, and in every district, a police magistrate and a very large number of justices of the peace. It cannot be said that crime is more prevalent in Queensland than in any other part of the world—in fact, we have no great criminals. Occasionally a few burglars disturb the peace of mind of honest citizens—a wilful murder sometimes crops up; but, considering the vast extent of the colony and the utter independence of its inhabitants, crime may be said to be at a minimum. In 1880, when thousands had swarmed to the new goldfields, it was found that out of 53,000 people, comprising the population at that time of our five largest towns, the number of convictions was only forty-four, and in the Northern circuit, out of 17,000 persons the convictions were six. Of these fifty, only five were murder cases, and two of these were not proceeded with.

There are several penal establishments in Queensland, the most noted being a beautiful island in Moreton Bay named St. Helena. Here the long-sentence prisoners devote their enforced leisure to the cultivation of sugar, the manufacture of harness, to white smithery and tailoring, to the extent of a gross return for the island products of about £8,000 per annum. Juvenile offenders are sent to reformatory institutions for various periods, and numbers of the lads who have been permitted to take service with responsible persons have turned out very good members of society—thanks to the excellent system adopted for the reclamation of the incipient criminals.

IMMIGRATION.

In the early times of the colony inducements were held out to intending emigrants from the old country to turn their faces toward Queensland, by offering them grants of land amounting to 40 acres for each adult. Every person arriving in the colony received a “land-

order" entitling him to take 18 acres of land, on presentation of the order for that amount. After two years' residence he obtained the balance of the order (£12), and could then take up 12 acres more.

As the colony became more populous these orders were abolished, and free immigration was instituted, and continues to the present day. The result has been that from 15,000 to 20,000 persons arrive annually in the colonies.

There is now plenty of splendid agricultural and grazing land to be obtained at reasonable prices and by payments extending over ten years.

RAILWAYS.

Unlike America, Queensland cannot boast of vast rivers intersecting, together with their broad tributaries extended over areas of fertile country. The rivers of Australia generally are broad, certainly, but the aqueous portion of them bears no comparison to their beds. In wet seasons huge volumes of water come roaring down from the mountains, sweeping before them trunks of trees and everything which lies in the way of the resistless power. At these times the rivers are generally impassable, some of them having a width of over a mile, whilst the adjacent country is frequently inundated to shallow depths for several miles. It will be obvious, from what has been said, that our rivers can only serve to a limited extent for navigation purposes. Fifty to sixty miles inland from the coast is the limit of navigation for sea-going vessels. To tap the interior, railways were required, and this want has been duly recognised by the various Governments who have held the reins of power in Queensland since the year 1864. In that year a commencement was made with the Southern and Western Railway, which connects Brisbane with the western cities of the plains, and with those on the southern border of the colony adjoining—New South Wales. It was decided, at the outset, that our railways should be built on the narrow-gauge (3 feet 6 inch) system, and this gauge has been adopted in the construction of all our lines. The greatest obstacle to railway communication with the interior in this colony, as well as in the sister colony, was the precipitous Main Coast Range. But engineering skill surmounted the difficulty, and the first line, which connected the capital with Toowoomba, a large and thriving city situated just above the range at the edge of the table-land, was successfully carried over a height of 2,600 feet. The scenery, as the range is mounted, is magnificent. The line vies with the Union Pacific Railroad in the United States in tall spider-like bridges spanning fearful looking gorges, and in tracks passing round the precipitous spurs of the mountains. Cuttings and tunneling are met with from the moment the ascent commences. The steepest gradient in this line is 1 in 50. Notwithstanding the apparent danger attending a journey on this portion of the line no accident involving loss of life or serious injury to rolling-stock has occurred here during the twenty years which have elapsed since the first engine ran on it. To the excellent system of management and the careful supervision exercised over every portion of the line must be

attributed the immunity from accident which has characterised the working of all our railway lines. Every year sees the existing lines extended. In 1865 there were 21 miles of rail open for traffic. By the year 1871 there were 218 miles open. Nine years later the mileage reached 635, and the returns for 1883 show a total of 1,080 miles, with an additional 410 miles in progress. The amount expended on these lines, which return a net revenue of £2 10s. 11d. per cent., has been nearly £10,000,000. Most of the rolling-stock required is now manufactured in the colony. Locomotives only are imported, and this, not because they could not be well made in the colony, but owing to the high price of material and labour. A great many lines have yet to be constructed, and some of these are now being surveyed; for others tenders have been already called, notably for a line to connect Brisbane with the Gympie Gold Field. The route passes through splendid agricultural districts and tops a range of mountains abounding in valuable timbers, such as red cedar, pine, beech, hardwood, &c. It is fully anticipated that this line will pay, when completed, a high per centage on the cost of construction. Indeed, the passenger and goods traffic on our railways is increasing so rapidly that the Department of Public Works can barely keep pace with the requirements. Whilst British capitalists are turning their attention to the colonies as a field for investment, Queensland appears to offer special inducements for the employment of that capital in railway construction.

WATERWORKS.

Most of our towns are so situated that the construction of water reservoirs has offered no serious engineering difficulties. The Brisbane waterworks were commenced in 1865, and were completed at a cost of £66,000. A chain of hills some seven miles from town offered an excellent site for a reservoir. The natural features of the ground were largely availed of, and out of a watershed of 2,590 acres, 186 acres were laid under water, thus giving an available supply of 1,000,000,000 gallons, and this as yet has been found sufficient to supply the ordinary wants of the city in a fair season; but under abnormal conditions of weather it was feared that a scarcity might result, and a second reservoir has just been completed, connected with the first, and both are finally to be fed from the heads of the Brisbane River. The supply will then be large enough to meet any emergency in the shape of drought, or rapid increase of the population of the city. The extension alone will supply 40 gallons per head to a population of 100,000.

All our large towns have been supplied by artificial means, and no expense has been spared to render these means efficient.

The continued dry weather of the year 1885 has caused most pastoral tenants to look about them for a continuous water supply; and in most instances shallow sinking or boring has brought to the surface large stores of excellent water, whose existence was not even suspected. The water supply for the interior is now being taken in hand by the Department of Public Works, and under its auspices

boring appliances have been sent out to the far west. Thus it will probably not be long before the Western country will be comparatively independent of the surface water, artesian wells having been found to answer all requirements.

TELEGRAPHS.

Simultaneously with railway construction telegraphic communication was initiated. For many years the only means of conveying information from the seaboard to the interior were the coach and the horse mail. Matters of vital importance therefore had to await transmission by these comparatively slow appliances. Neither rapidity nor certainty were ensured. Hence the necessity for electric communication was early recognized, and the work once initiated was pushed on with such celerity that in 1881 there were $6,270\frac{1}{2}$ miles of line in operation, carrying 9,222 miles of wire. There are now nearly 11,000 miles of wire open for public business, whilst about 300 miles of wire are employed for telephonic purposes. The telephone has been adopted very largely in all our towns; and every business place of any importance is connected with a central telephone exchange. Queensland is connected with all the other colonies by telegraph, and, by means of the South Australian Overland Telegraph line, with the whole civilized world. Messages of ten words, exclusive of the sender's name and of the address of the recipient, which are not charged for, can be sent to any part of the colony for 1s.

STEAM NAVIGATION.

The increase of population, and the extension of business relations with the northern portions of our own colony, and with the outside world, has had a remarkable effect upon the development of both ocean and coastal steam communication. For many years the Australasian Steam Navigation Company of Sydney enjoyed a monopoly of the coasting trade. Of late years, however, the trade has been gradually wrested from the erstwhile powerful association. After several attempts by individuals, Messrs. Howard Smith and Company began to run steamers on the coast. These gentlemen, trading under the style of the Melbourne Steamship Company, ran their boats as far north as Rockhampton in Queensland, whilst the Australian Steam Navigation Company abandoned the Tasmanian and New Zealand trade, but extended their operations to Cooktown in the far north of the colony and also to San Francisco *viâ* Honolulu. Since that time, the British India Company, under contract with the Queensland Government, which binds the latter to the payment of a subsidy of £60,000 per annum, have carried out a monthly mail service between England and Queensland with the greatest regularity. This company also runs fortnightly boats, and all bring a large number of immigrants to our shores. The Queensland Steam Shipping Company have lately placed some magnificent coasting steamers on the line running from Sydney as far north as Cooktown, and Thursday Island in Torres Straits. The China steamers also make regular calls at our ports, as do

those of the Eastern and Australian, and of the Dutch East India Companies. The ports nearer Brisbane are served by a host of smaller steamers belonging to private firms. The tonnage inwards amounted last year to 1,437,824 tons, whilst the outward tonnage reached 1,247,479 tons. It will be seen from the above statement that by means of our coastal navigation appliances, the greatest facilities are afforded to those whose business or inclination takes them to the different parts of the colonies.

The trade of the colony is so fully dealt with in another article that it need not be referred to here.

EDUCATION.

The colonists having succeeded in obtaining separation from New South Wales, determined to inaugurate a system of National Education, rightly judging that by spreading the light of knowledge, crime would be lessened, and thus the colony would reap a direct advantage from the money devoted to educational purposes. A Board of six gentlemen was accordingly appointed to supervise and direct the establishment and carrying out of the scheme. Under their direction national or primary schools soon began to multiply in the land. A large central school, entitled the Normal School, was built in Brisbane, where teachers were subsequently trained for their work. In the other towns and country districts schools were built, on a requisition of the residents, accompanied by an amount equal to about one-fifth of the estimated cost of the building. Wherever twenty children of school age—*i.e.*, above five years—could be got together, there a school was established, a teacher was supplied and paid by the Board. Inspectors were appointed who, at short intervals, visited and reported upon the various schools in their respective districts. The result of this legislation was that in a short time no district, however insignificant, was without its well-appointed school.

The tone of the Queensland primary schools is very high, since they are—unlike the national schools of the old country—attended by the children of all classes of the community. The sons of barristers, bankers, judges, merchants, sit on the same form with the children of the farmer, mechanic, and labourer. To this fact we owe much of the excellence of our national schools, and of the favour with which the colonists regard them.

During the first few years of the colony's separate existence, small fees were demanded of each scholar, according to the class he attended at school. This tax was abolished in 1864, through the efforts of Mr. (now Sir Charles) Lilley, the present Chief Justice of the colony. The teachers, on the abolition of the fees, received a compensating addition to their salaries.

The Board of Education was abolished in 1876, and the Government undertook the entire management of, and control of, the educational establishments of the colony. Mr. Samuel Walker Griffith, the present Premier, who was in that year Attorney-General, was appointed Minister for Education, with Mr. Graham for Under

Secretary.. Under the charge of these gentlemen the Department of State Education was conducted in a manner which gave complete satisfaction to the general public, and no appeal was ever made in vain to the Minister from the smallest district, provided that reasonable grounds could be shown for granting the application. The schools, since the day that the Government undertook their control, have multiplied at a remarkable rate; but the demand for them still goes on. In 1881 there were 43,305 children on the rolls of 350 schools, which employed 1,000 teachers—male and female. To-day there are 46,262 children on the rolls, the average attendance being nearly 60 per cent. of those enrolled. Thus it will be seen that about one-seventh of the population of the colony is under school instruction.

Besides the primary, there are several denominational schools in healthy operation, five grammar schools endowed by the State, and several well-attended private schools. But we have yet progressed a step or two further towards the higher education of our youth. Scholarships entitling the winners to free education at the grammar schools are granted yearly to girls and boys of primary schools, who, between the ages of 12 and 14, can pass a certain examination. These scholarships are open to any boy or girl from any primary school in the colony. About 25 per cent. of the candidates pass every year, and it is a fact worth recording that those youths who have distinguished themselves both at the grammar schools and at the various universities of Australia and of the United Kingdom will be found as a rule to have been scholarship boys who commenced their educational career in the primary schools. The attainment of a grammar school scholarship, however, does not limit the range of our ambitious youth. The State provides for exhibitions to universities, tenable for three years; and without exception the winners of these exhibitions have triumphantly carried the banner of their Queensland schools through the ordeal of the legal, medical, theological, and scientific examinations at the universities of Oxford, Cambridge, Edinburgh, Sydney, and Melbourne. Enough has been said on our system of State education to show that a Queensland youth has only to develop ability to be helped to the highest standard of education, and, as a necessary corollary, to the highest honours which the various learned professions can offer.

The religious education of the juvenile population is diligently attended to by the various denominations, mainly through the instrumentality of the Sunday schools. The Brisbane Sunday School Union, a union of all denominations except the Church of England and the Roman Catholic, exerts a powerful influence on the young. Every year a gathering of the various Sunday schools takes place in the Botanical Gardens. Over 6,000 children, attended by their teachers, marched in procession to the gardens in May last, where they were addressed by His Excellency the Governor, who takes great interest in the movement.

Schools of Arts exist in all our towns, and these, especially in Brisbane, are what their name implies—institutions in which those

who cannot attend day-classes may obtain instruction, technical or otherwise, in the evening. Drawing, painting, science, mechanics, and carpentering, are here taught by well-qualified instructors.

Under the head of educational establishments may be classed museums. The Brisbane Museum is a spacious stone and brick edifice, occupying a fine site overlooking the river. The student of natural history, botany, geology, mineralogy, or archæology, may here find a rich field for investigation. A country such as Queensland, possessing fauna, flora, and minerals of such varied forms, contains within itself all the elements for the formation of a vast museum, which not only affords instruction to the colonists, but is of great utility to scientific men of other lands. The Brisbane Museum is thrown open to the public on Sunday afternoons, and numbers of persons avail themselves of this boon.

LITERATURE.

The Englishman all over the world appreciates his daily paper. Queensland Englishmen are no exception to the rule; hence it follows that the literature of the colony as represented by the Press is large and varied. Every town possesses its newspaper; some, three or four—daily, weekly, and bi-weekly. Many of these journals are of a very high class, and nearly all of moderate tone, which causes them to present a very vivid contrast to the highly-spiced sensational journals of our cousins over the Pacific. Queensland can boast of writers in other walks of literature, whose productions have been very favourably received in the old country; and the services of these gentlemen are accordingly in constant request by the leading journals.

SOCIAL FEATURES.

Queenslanders are essentially a clubable, meeting-holding, society-forming people. It would take up too much space to enumerate the numberless societies which are in operation in the colony for social ends. Two excellent clubs in Brisbane are devoted to the usual purposes of such institutions, and both are in a flourishing condition. The Johnsonian Club is, as its name implies, a literary stronghold, composed of votaries of art, science, literature, law, and music. It is conducted on the lines of the Savage Club in London, and numbers some 200 members. Once a month the members meet, and after a Spartan supper, substituting fish for black broth, the evening is spent in music, recitation, and congenial conversation. The club has lately been affiliated to other literary clubs in Australia, and to the Savage Club. The Good Templars, Rechabites, Salvationists, and Oddfellows, are numerous represented, and all have their lodges, barracks, and meeting-houses. The Freemasons are a powerful body, working under the three constitutions, England, Scotland, and Ireland. The foundation of a new Freemasons' Hall was laid the other day with great pomp and ceremony, in the presence of a large concourse of people. Theatres are well patronised, as are also concerts, especially those

of the Musical Union, where high-class music is excellently rendered. Of junketings, tea-meetings, picnics, and steamer excursions there is no end.

The chief State holidays, of which there are five in the year, are times of great merrymaking. On these occasions the railways, steamers, and other means of conveyance are crowded by thousands of eager holiday-makers. But the great event of the year is the Exhibition of the National Agricultural and Industrial Association of Queensland. This society is a thoroughly national institution. Its ramifications extend throughout the whole colony. Inaugurated by a few far-seeing colonists in 1876, it soon assumed large proportions. The colonists as a body combined to render it a useful and successful institution. The work done by it has been of immense value. Through its instrumentality both pastoral and agricultural properties have greatly improved in many respects, and our varied resources have become more widely known, and have been developed to a greater degree than they were prior to the formation of the society. The annual exhibition is now eagerly looked forward to by the people. In August of each year the three days' carnival takes place. The show is opened with great ceremony by the Governor in person. On the opening day, it is generally impossible to obtain even a glimpse of the varied exhibits which fill the Exhibition building. Thousands of visitors pour in from town and country. For three days business is almost entirely suspended, the whole population giving itself up to the enjoyment of its grand *fête*. The society is consequently in a most flourishing condition, and is in a position to carry out new ideas and improvements every year.

Like all English-speaking people the colonists are fond of horse-racing and athletic sports. Every township in the colony has its racecourse and cricket-ground. The youth of the colony are ardent footballers, cricketers, and bicyclists. Regattas are held annually, and on these occasions our boating men give good evidence that the pluck and skill of the fatherland has been carried to the "Greater Britain." Athletic sports are frequently held, when jumping, foot and bicycle racing, cricket-ball throwing, &c., &c., are indulged in with great animation.

RELIGION.

Nearly all the religious denominations of the old country are here to be found in full and successful operation. The church has no connection with the State. Each congregation supports its own minister, and the spiritual wants of the community are thus fairly supplied.

Allied closely to the churches are various charitable institutions, such as the Benevolent Asylum at Dunwich, a place of refuge for old and destitute persons, where the inmates are well cared for, and pass away life in a comfort which under other circumstances would be utterly beyond their reach. Of Orphanages there are six in operation, which undertake the care of nearly 1,000 children, who either through misfortune or the dissolute habits of their parents would have become homeless vagrants but for the care of the State. Lunatics are

provided for in six asylums and reception-houses. There are hospitals in every town of any size in the colony, supported partly by Government endowment, partly by private subscription. The Brisbane Hospital is a noble institution, as is the Hospital for Sick Children; both are well-supported by the public. Other charitable institutions are Relief Boards, Female Refuges, Lying-in Hospitals; and the Brisbane Benevolent Society, which does good work in enquiring into and relieving cases of distress.

DEFENCE.

The colony has up to a very late period depended almost exclusively upon the mother-country to defend her in case of hostile attack from without. Considerable numbers of men had been enrolled in various volunteer corps, and in 1882 the total strength of the force was 1,372, of whom probably not one-half were efficient. Of ships of war there were none, whilst the only appliances for land defences were a few field guns, and a battery of six or eight old-fashioned smooth-bore 24-pounders, dating from somewhere about the year 1791. If we except the single item of pluck (which all Englishmen inherit, whether they are born in the Arctic regions or in the Tropics), the colony was deficient in everything which could aid to defend it from an enemy's attack.

In 1884, however, a move was made in the direction of defence. Two gunboats and a torpedo-boat were ordered from England, and they have since arrived here. One of the former is stationed at Brisbane, the destination of the other is not yet determined. Furthermore, an Act was passed by both Houses providing for the defence of the colony, which repealed the old Volunteer Act of 1878, and of which the following are the provisions in brief:—All the male inhabitants of the colony between the ages of eighteen and sixty years are liable to serve in a Defence Force for a period of three years from date of enrolment. The male population liable to serve is divided into four classes, according to age and conjugal condition. The Defence Force is distinguished as Active and Reserve—Land and Marine—the Reserve Force consisting of all the men who are not serving in the Active Force for the time being. These forces are divided into batteries of artillery, companies of mounted infantry, engineers, submarine miners, garrison artillery, battalions, regiments, and companies of infantry; and the Marine Force includes seamen, marines, and torpedo corps. The arms and accoutrements for all non-commissioned officers and men are provided by the Government, subject to certain restrictions. Commissions in the force are granted by the Governor, and all officers must undergo examination and obtain a certificate of fitness from a board of officers. The examination varies in degree for each rank, and consists partly of a written examination and partly of practical work in the field.

In time of war or threatened invasion, should the various corps not be brought up to their strength by voluntary enlistment, the necessary number of men may be drawn by ballot in each military

district. The drill and training of the Force is also provided for. Every man, to become efficient, must undergo ninety-six hours' drill in the year, including eight days in camp. These drills are paid for at the rate of 1s. per hour for the privates. Officers and non-commissioned officers are paid in proportion. In addition to these paid drills, all ranks are expected to perform at least seventy-four hours' unpaid drills annually. During their period of active service, the whole Force is subject to army discipline, as set forth in the "Queen's Regulations."

Besides the citizen Force, a permanent Force has been established, to consist of a maximum strength of 150 men. This corps, known as "A Battery," serves the purposes of instruction to the remainder. The men are provided with lodging in the Victoria Barracks, and are treated in precisely the same manner as the regular forces at home, with the exception of pay, which is much higher here. Gunners, drivers, and trumpeters receive 2s. 3d. per diem; bombardiers, 3s.; corporals, 3s. 6d.; sergeants, 4s.; quartermaster-sergeants, 5s. 6d., with free kit and uniform, free quarters, fuel, light, and rations.

The available Force of all arms amounts now to a strength of 2,585 men, to which must be added a fine body of 600 police, all well-drilled and trained men.

The war material for the defence of our coasts is not at present very extensive. The entrance to the Brisbane River at Lytton is defended by a fort mounting two 64-pounder guns and one 6-inch gun. Earthworks are also thrown up on a hill overlooking the sea, about a mile from the fort. All appliances for "booming" the river and for laying torpedoes are at hand. The Lytton defences are supplemented by the gunboat "Gayundah," the torpedo boat "Mosquito," and during the "war scare" three or four small steamers were purchased and armed by the Government. Townsville is protected by two 64-pounder guns mounted in commanding positions, and these will be assisted in case of need by the gunboat "Palumah." Many of our coast towns are, however, fairly defended from attack by the nature of their surroundings. Rockhampton, for instance, is situated 34 miles from the estuary of the Fitzroy River, which is unnavigable for vessels of deep draught, and those of lighter build would require pilots having an intimate acquaintance with the banks and shallows with which portions of the river abound, to enable them to reach the city. With a few well-served torpedo stations at intervals on the banks, Rockhampton would be practically impregnable. The same may be said of Maryborough, which must be approached by a tortuous river.

Townsville, Bowen, Cooktown, and Gladstone are by position the most defenceless, but steps are being taken to utilize the natural advantages of the sea-front for defensive purposes.

The whole of our Defence Force is under the supreme command of His Excellency the Governor, as Commander-in-Chief. Colonel French, C.M.G., R.A., has been appointed Colonial Commandant, with Major Grieve, R.A., in command of the various artillery corps,

including "A Battery." The infantry are supervised by Captain C. H. Des Vœux, B.S.C., Captain J. Sanderson-Lyster, Brigade-Major.

At Easter all the corps are called out for eight days' training in camp, and the results of such training have become very apparent in the increased smartness of the men. Lately, when war with Russia appeared inevitable, the utmost enthusiasm prevailed amongst the colonists. Hundreds of men enrolled themselves either in the Defence Force or the Volunteers. The Police volunteered in a body for active service. Gentlemen belonging to all professions hastened to offer their services to defend their adopted country, and there is not the smallest doubt that, had hostilities actually broken out, the whole male population to a man would have voluntarily come forward to take part in the struggle. Like his American congener, the Queenslander is a peaceable business man when let alone, but once roused by outside aggression he is prepared to submit to any sacrifice to maintain his rights, and in such a case the hereditary dogged obstinacy of his race comes out conspicuously.

SOCIAL CONDITION OF THE MASSES.

As yet there is no leisurely class amongst the colonists. Queensland is a large hive, in which all the bees are hard at work and tolerate no drones. There is so much to be done to keep the colony in pace with other countries that even those whose private means might entitle them to rest do not do so. They work as hard as, if not harder, than those whose necessities compel exertion. But the inducements to work are here very great. Wages are high, and workers not over numerous. As a consequence, the Queenslander, especially the working man, is in a thoroughly independent position. If he works hard he is well paid, and can afford to enjoy, to the top of his bent, the numerous holidays afforded him. In the old country a Bank holiday means a serious loss to many ill-paid labourers. Here, holidays are eagerly looked forward to by all classes. On these occasions an excellent opportunity is afforded to observe the evident comfortable circumstances of the working man. He and his family are well-dressed, they have plenty of spare cash, and can afford to enjoy themselves.

The thrifty amongst them invariably have an account at the Government Savings Bank, and very few of these latter have failed to become possessors of an allotment or two of land, on which they have erected small but comfortable residences. They have thus no rent to pay, and whatever additions or improvements they make, serve to enrich themselves instead of the landlord. Most of the friendly societies are officered by the respectable steady mechanic, who also fills in many cases more responsible positions. The farming class are equally independent. Notwithstanding occasional dry seasons and consequent loss of crops, they fight their way through with eminent success, thanks to energy, a splendid climate, and rich soil. In fact, the farmers may be looked upon as the most thoroughly independent

class in the country. They rule their own districts by means of the Divisional Boards; they all have a voice in the election of members of the Legislative Assembly, and often have been returned as members themselves. It may be said that, taking one industry with another, the general mass of the people of Queensland are better paid, better fed, better clothed, and more happy and independent than those of any other country outside of Australia.

Everywhere the cry is for more hands; on all sides our manufactures are increasing. Good wages await any man or woman willing to earn them. Thousands of acres of land are ready for the shepherd and the farmer. Our trades have openings for an unlimited number of the right class of immigrants. Female domestic servants are wanted in all parts of the colony, and the highest rates of wages can be obtained. Many of the good folk at home have an idea that Queensland consists mainly of bush and blackfellows. If they could be suddenly transplanted to Brisbane on a Saturday evening they would be surprised to find how much it resembles London. The streets are crowded with tram-cars, omnibuses, and cabs; the splendid shops are brilliantly illuminated; the railway station is lighted by the electric light; the river is alive with shipping; whilst the crowded streets render walking or shopping as much a matter of difficulty here as in the metropolis of the world. They would find the people no whit different from those they had left behind, except in the matter of independence and well-lined pockets. The Anglo-Australian race is merely a transplanted Anglo-Saxon race.

Last, but not least, the Australian is loyal in thought, word, and deed. He looks upon England as "home." Middle-aged men, born in the colonies, invariably speak of the old land as "home;" and the grand old National Anthem, as soon as heard, brings every Australian, bare-headed, to his feet as he re-echoes the words "God Save the Queen."

EDUCATION IN QUEENSLAND:

BY THE

REV. WILLIAM POOLE.

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EDUCATION IN QUEENSLAND:

BY REV. WILLIAM POOLE.

HISTORY.

BEFORE entering upon a description of the present mode of State Education in the colony of Queensland, it will be well to give a brief sketch of the past, so that the progress made in the matter of public instruction may be duly noted. From the commencement of its existence as a separate colony, Queensland has been very liberal in the provisions it has made for educating the youth in her midst. In June, 1859, the Moreton Bay district was constituted a self-governing colony; and in the very first session of the first Parliament of Queensland, namely, in 1860, an Act was passed for the establishment of Primary Schools in the colony wherever the population required them. This Act had as its basis and exemplar, the National system as instituted by the Royal Commissioners for Ireland, and, as under this system the parent colony of New South Wales was working at the time of separation, the means were ready to hand for the framing of a measure for Queensland.

The schools established under the original Queensland Act were divided into two classes—namely, vested, and non-vested. The vested schools were unsectarian in their character but not secular, for in the ordinary syllabus scripture reading found a place, and the enforcement of moral duties by suitable selections from the New Testament formed part of the teacher's work. While this was done the inculcation of the peculiar tenets of any denomination was strictly prohibited. The books used were those published by the National Commissioners of Ireland. The control of these vested schools was in the hands of a Board of Education appointed by the Government, and consisting of six members, the chairman being one of the political Ministers for the time being. This Board had committed to it the directing of all expenditure, the appointment of teachers, and the administration in every way of the Education Act. From money voted by the Parliament, it provided for the erection of buildings and the payment of teachers, whose salaries were supplemented by school fees, ranging from 6d. to 1s. 6d. per week. After the Act had been in force for some time the fees were abolished, and the teachers' stipends were augmented by increased payments from the revenue; and for the first time education was made free of cost in Queensland.

The non-vested schools were established by, and under the direct control of, the Anglican and Roman Catholic churches, and for these buildings were provided and teachers supplied by the religious bodies to which the schools belonged; but State aid was given in the shape of salaries to the teachers, and grants of books—all other expenses being met by the religious denominations. In these schools any religious doctrine could be taught, either by the teachers or by the ministers of the church to which the school belonged. In common with the

vested, the non-vested schools were under Government inspection ; but in the former this inspection extended to both secular and religious, while in the latter it applied to the secular instruction only. Thus, side by side, we had the national and the denominational systems at work ; and this state of things continued up till 1875, when a fresh measure dealing with Education was passed. This new Act abolished the old Board, and created a Department of Public Instruction, to be worked under the control of one of the Ministers of the Crown. As the provisions of this Act come under notice later on, it is mentioned here, mainly for the purpose of pointing out that it provided for the withdrawal of all State aid to non-vested schools on the 31st December, 1880. Since that date non-vested schools have not received any help from the Government ; and, except those sustained by the Roman Catholic Church, such schools have ceased to exist. Mr. Randall MacDonnell was the first Inspector-General under the Education Act of 1860 ; and to this day testimony is borne of the successful and impartial manner in which he organised the primary schools of the colony, in the early years of its history. Mr. J. G. Anderson, who is now the Under Secretary of the Department of Public Instruction, was to Mr. MacDonnell an able coadjutor, and also wrought hard, so as to put our educational system of past years in good working order.

As giving additional evidence of the interest felt in Education, it may be mentioned that also in 1860 an Act was passed to provide for the the establishment of Grammar Schools in Queensland, and the preamble of this measure is noteworthy. It runs as follows :—“Whereas it is expedient for the encouragement of learning, that public grammar schools should be established in the colony of Queensland for conferring on all classes and denominations of Her Majesty’s subjects resident in the colony, without any distinction whatsoever, the advantages of a regular and liberal course of education : Be it therefore enacted, &c., &c.” This Act, which is still in force, but amended in one particular, provides that when £1,000 has been subscribed for the purpose of establishing a public grammar school, the Governor in Council may order twice that amount to be paid out of the general revenue of the colony to trustees, duly appointed, for the purpose of building premises for such grammar school. At first, the maximum to be paid by the Government, in aid of salaries, was fixed at £500 per annum ; but later legislation provides that when £2,000 has been given by the public towards the grammar school, and fees to the amount of £500 per annum, shall be guaranteed for three years, then the Governor in Council may order £1,000 per annum to be paid out of the general revenue towards the stipends of masters and teachers, and the necessary current expenditure of the schools. Ten per cent. of this annual endowment may, at the discretion of the Governor in Council, be reserved any year, for providing Scholarships or Exhibitions at any British or Australian University. In addition to this, the Governor in Council, with the consent of the Legislature, may permanently endow any public grammar school with Crown land, in or near the district in which the school is situated, to an extent not exceeding £2,000 in

value. Under this Act, public grammar schools have been established as follows:—Brisbane, 2, Boys and Girls; Ipswich, 1, Boys; Toowoomba, 1, Boys; Maryborough, 2, Boys and Girls; Rockhampton 1, Boys and Girls. The working of the grammar schools will be found dealt with further on.

So far the history belongs to the past, and it would not be right to conclude this part of the paper on Education without a reference being made to Sir Arthur Palmer, Chief Justice Lilley, the Hon. S. W. Griffith, the late Hon. T. B. Stephens, and to many other public men, whose active exertions in the past have made our primary and our grammar schools the successful institutions they have become. Many have laboured to this end, but the gentlemen whose names are mentioned have been in the first rank. Now the ground has been cleared and the way is open for dealing with education in Queensland.

AS AT PRESENT CONDUCTED.

In the Act of 1875, three cardinal principles were laid down and incorporated in its provisions. It was settled that the State education in the colony should be Free, Secular, and Compulsory.

So far as the tuition is concerned, the first of these is fully carried out, but it is not applicable to the cost of the buildings, for before a new school can be erected, the inhabitants of the locality in which it is required must pay to the Minister administering the Act, or to his credit in a bank, a sum equal to one-fifth of the estimated cost of erecting and furnishing such school buildings as the circumstances of the district demand. With regard to the second—that the education provided be secular—that is fully carried out, in fact more so than in any of the other colonies. There are some reading lessons in the school books that touch religion, and that is all, but the teaching nevertheless, may be described as completely secular. So much does it bear that character, that a shrewd observer has said, that in a Queensland State school a teacher may impress upon a boy that a lie is wrong, because it may injure another, or because it is a violation of the law of veracity, which should ever be observed because by so doing the welfare of the community is maintained, but the teacher must not enforce truthfulness, because lying is an offence against God and a breach of His revealed will. Such possibly may be an extreme representation of the case, but it will tend to show how thoroughly secular our State school system is. For this secular instruction the Act provides that four hours at the least in each school day shall be set apart, but by regulations issued by the authority of the Governor in Council it is required that instruction shall be given for five hours in each day, except in the case of infant schools, where the time is limited to four hours. While the instruction given by the teacher within the school hours must be thoroughly secular, under the regulations which the Governor in Council may make from time to time, it is provided that ministers of religion or persons recommended by such may, in the school building, after school hours, give religious instruction to children willing to receive it.

This permission has not been used to any great extent, and where it has been used the success has not been marked. For a time both children and instructors have evinced considerable interest, but those who give the religious teaching find it sometimes difficult to attend; breaks thus occur, and the attendance of the children falls off. It is also found that men who can well hold the attention of adults have not all the faculty for dealing with children, and this, too, may possibly account or help to account for the falling off always noticed in these classes for religious instruction after school hours. Many of the children, too, feel that it is an extra time of schooling, and therefore absent themselves from teaching, at which voluntary attendance only is asked. Judging from results at this present stage, it cannot be said that the attempts hitherto made to supply our State schools with religious instruction have been a success. Here it may be added that the school teachers are by regulation prohibited from acting as lay readers, local preachers, and from filling any quasi-clerical position.

As regards compulsory education, all that can be said is that clauses requiring such exist in the statute, but they have never been enforced. The Act demands that the parent of every child, of not less than six years nor more than twelve years of age, shall, unless there be some valid excuse, cause such child to attend a State school for sixty days at least in each half-year. Any parent neglecting or refusing to send such child to school for the period mentioned, and not having a valid excuse, is open to prosecution, and on conviction is liable to a fine of twenty shillings for a first offence, and five pounds for any subsequent offence; in default of payment, imprisonment may be ordered for seven days for a first offence and thirty days for a second or subsequent one. So stringent are the clauses dealing with compulsory education, that only four reasons for not sending a child to school are accepted as valid reasons. First, that the child is being efficiently taught; second, sickness, fear of infection, or any unavoidable cause; third, no State school within two miles of the child's home; and, fourth, that the child has been educated up to the prescribed standard. The reason why these compulsory clauses are not carried out is, that they can only be enforced in such parts or districts of the colony as the Governor in Council shall proclaim from time to time as within their operation. Such proclamation has never yet been made for any part of the colony, and therefore the clauses are inoperative. It is not likely they will remain so much longer, for every year reveals the necessity of action in this direction, if we would preserve some of our juvenile population from ignorance, and possibly from crime.

EXISTING SCHOOLS.

The State schools now in operation are divided into two classes—namely, State schools proper, and Provisional schools. The State schools are those noted above as built and maintained entirely at the Government expense, except, as already mentioned, that the residents of a locality are required to furnish one-fifth of the cost of erecting and furnishing the buildings needed. These schools are supplied by

the State with all materials for school work—such as text-books, apparatus for teaching, and other needful things, leaving only such minor requisites as pens and pencils, and materials for home lessons, to be provided by the parents. Before one of these State schools can be established it must be shown to the Minister administering the Act that a regular attendance of thirty children is probable, and should the average daily attendance fall below twenty-five, then the school, by order of the Minister, may be closed as a State school. The course of instruction in these schools includes reading, writing, arithmetic, English grammar, geography, history, elementary mechanics, object lessons, drill and gymnastics, vocal music; for girls, domestic economy and needlework. These various branches are taught to such a standard that an ordinary boy, if at all diligent when at school, will on leaving at, say from twelve to fourteen years of age, be very fairly equipped for life's work. He will at least have a good foundation prepared for a superstructure that he can build for himself; he will have been taught how to carry on his education as his years advance; and if inclined to follow up his education at the Grammar school, he will find that his State school teaching has not only fitted him for entrance upon the curriculum there, but it has placed him in a very good and indeed advantageous position from which to enter upon higher studies.

The Provisional schools are intended for districts sparsely populated, or for cases of emergency, when for special local purposes a large number of persons may be called upon to reside for a short time only in certain places. In every regular Provisional school, the average attendance must not be less than twelve children of school age. When the teacher has two or more schools under his charge, and gives a part of his time to each, the average attendance at each must not be less than six, and to meet the case of neglected children special Provisional schools may be opened either in the evening or at any suitable time. Here the average attendance must not fall below twelve children of school age. The teachers for these schools need not be classified under the Education Act, although their salaries are paid by the State. Towards these salaries it is expected that local contributions will be forthcoming; but as a rule these contributions are few and far between. For these Provisional schools the residents of the districts in which they are opened have to provide a building at their own expense. Should the time arrive when the Department would be justified in so doing, these Provisional schools are changed into State schools and made permanent institutions.

When the requisite conditions have been complied with, by the promoters either of State or Provisional schools, an application is made to the Minister in a form set forth in the regulations, and duly signed by the residents. Then such application is granted or refused by the Governor in Council, as the circumstances of each, in his opinion and that of his Ministers, may require. At the end of 1884 there were open and in operation in the colony 263 State schools, and 150 Provisional. These have a staff of 1,152 teachers—554 males and 598 females. The annual enrol-

ment of scholars was 52,556; the mean quarterly, 39,925; and the average daily attendance, 27,863. Considering the manner in which the population is scattered throughout the colony, these figures speak well for the parents who desire the education of their children, and for the Department in its endeavours to supply means of instruction wherever they are required. The territory occupied by these schools is exceedingly large, stretching from Thursday Island in the north to Stanthorpe in the south, and from Brisbane in the east to Thargomindah, Winton, and Cloncurry in the west. Some idea of the area occupied may be gathered from the reports of the inspectors, one of whom states that to visit the schools in his districts necessitated his travelling 6,992 miles, and his occupying nine months in his journeyings. These districts are by no means getting easier for an inspector to visit, for the schools are increasing from year to year; and even the railways open and in course of construction will not aid very much in reaching the outlying regions and the new settlements that are constantly being formed.

Any mention of the schools in the colony would be incomplete if reference were not made to the many first-class private institutions that are at work, and doing good service for the youth of the colony. Then the Roman Catholics are sustaining their own schools in the colony, and though they receive no aid from the State, neither are they in any way subject to the State, yet they have voluntarily placed themselves under Government inspection, and the inspectors periodically send in their reports to the Department, which furnishes a copy to the Roman Catholic bishops. The Grammar schools of the colony have already been referred to. These, again, are entirely free from State control, but they are liberally endowed and subsidised by the Government, and must be reckoned as important factors in the education of the youth of the colony.

TEACHERS.

The 1,152 teachers referred to above may be roughly classed as head-teachers, assistants, and pupil-teachers. Of head-teachers there are 313 males and 101 females; of assistants, 98 males and 211 females; and of pupil-teachers, 142 males and 286 females; and of these it may be said that they are well trained, efficient, and will bear comparison with any teaching staff in the colonies. At the present time a few trained British teachers are introduced into the colony through the Agent-General, but the training of teachers for Queensland is mainly done within the colony. This is plainly to be seen from the number of pupil-teachers that enter the schools every year, and that pass on to the higher grade of assistant. At present all the training is carried on in connection with the schools to which the pupil-teachers are attached, and is conducted by the head-master or mistress of the school. It is very possible that before many years Queensland will have what is possessed by some of the other colonies, and what is very needful, a training institute for teachers. The standard of education that teachers must reach before they can be accepted by the Depart-

ment is high for each class, and a reference to the examination papers published by the Secretary for Instruction with his annual reports, at once reveals the fact that, whether for the position of pupil-teacher, assistant, or head-teacher, a fitting educational equipment is demanded. Every year the rejected candidates are sufficiently numerous to indicate that the test of fitness for employment in State schools is sufficiently severe, and is impartially applied. The remunerations received by teachers for their services cannot be regarded as excessive, even now that it has been somewhat increased from what it was in past years. Of course in noting the salaries, it must be borne in mind that the cost of living in Queensland is higher than in Great Britain, and that in some parts of the colony provisions and clothing are very dear owing to the high rates paid for carriage. The head-teachers' incomes vary from £400 to £200 per annum; this includes the classification salary and a capitation fee allowed by the Government at the rate of £1 for each scholar. In all cases rent is also allowed to the head-teacher of a boys' school, where no residence is attached to the school premises. Female head-teachers receive about two-thirds of the above amounts. The classified assistant-teacher's pay varies from £102 to £250 per annum for males, and from £72 to £150 per annum for females; while the pupil-teachers' salaries range from £40 to £70 for males, and from £20 to £50 per annum for females.

SCHOLARSHIPS AND EXHIBITIONS.

In addition to the ordinary instruction given to the pupils in the State schools, provision is liberally made for rewarding the diligent and painstaking among them, and those who may be desirous of entering upon a lengthened and higher course of study. Every year 120 State school scholarships are set apart for competition. Of these 90 are for boys, and 30 for girls. The scholarships, when gained, entitle the winners of them to a free education, at any Grammar school in the colony, for a period of three years. The only restrictions placed on the competition are as follows:—The candidates must be under fourteen years of age, on the 31st of December, in the year of examination; they must have been in fairly regular attendance at a State school, or other school under Government inspection (this throws the competition open to the pupils of Roman Catholic schools), for six months immediately prior to the examination; and pupils in the school for a period of eighteen months. The examinations are held simultaneously throughout the colony, the subjects being the same as those prescribed for children who have reached the fourth class in a State school. When the examination is over, the papers are forwarded to the Education Office, and the inspectors examine them and decide on the merits of each. The result of the examination for 1885 is just published, and it is found that for the 90 boys' scholarships no less than 103 attempted to gain them, but out of the 103 only 38 came up to the standard of the percentage of marks determined upon. For the 30 girls' scholarships 30 entered, but only 8 succeeded in carrying off the prize. The

number for winners in 1885 is considerably less than in previous years, and possibly results from the examination papers being framed on a higher scale than heretofore. Then every year a competitive examination for three Exhibitions to Universities is held, for which the papers are prepared and examined by the Professors of the University of Sydney. These are open to all students under 19 years of age; and the winners in the contest obtain an annual sum of £100 for three years, on condition that they proceed to some University approved of by the Governor in Council, and that they continue as students of such University for the whole period of the grant. These prizes have been open for competition since 1878, and the men who have gained them have in the majority of instances, if not in all, distinguished themselves at Sydney, Melbourne, Glasgow, Edinburgh, London, Cambridge, and Oxford. Indeed, the list of the men, with their doings after they have entered upon their University work, is one that the colony or any people might well be proud of. Out of the 21 successful competitors for those University examinations, no less than 12 were youths who had the foundation of their education laid at the State school, thence by a scholarship they passed to the Grammar School, and from thence to the University, where they acquitted themselves well, and did honour to the institutions in which they had been nurtured and trained.

CONTROL AND COST.

Under recent legislation, the Office for Public Instruction, instead of being administered by the Ministerial head of another department, has been placed under a separate Minister, called the Secretary for Public Instruction, and it is now presided over by the Hon. B. B. Moreton. Next to him, and the permanent head of the department, is the Under Secretary, Mr. J. G. Anderson, M.A. Under his wise management the system of instruction has well kept pace with the requirements of the colony; efficiency in the teachers has been sustained; and the standard of education for the young has been raised to a good position. Following him, we have a General Inspector and six district inspectors. These latter have each a district assigned, and what with travelling, school inspecting, examinations of teachers, making inquiries, reporting, and other work of a kindred sort, have their hands pretty full and their time well occupied. The corps of 1,152 teachers follow next, and then come the school committees. These find the one-fifth of the sum necessary for buildings, and have charge of the premises. They are expected to take a lively interest in the attendance, discipline, and effectiveness of the school, but they have no authority over the teachers, and any complaint they may have against them must be made to the Minister. The Department deems it wise to keep the control over teachers in its own hands; and, as a rule, the teachers, while glad of the co-operation of committees, prefer being subject to the Department rather than to the parents of the children they may teach. Of course, in addition to these there is the clerical staff, needed to carry on the business of the Department, but this hardly comes under the head of control.

The cost to the State of education increases rapidly from year to year. During 1884 the total expenditure on State education amounted to £150,160. Of this the departmental working expenses, and inspectors' salaries and expenses, absorbed no less than £8,695 2s. 2d.; and the State and provisional schools took up the balance, the State schools being debited with £131,339 6s., and provisional schools with £10,125 11s. 10d. For building and furnishing purposes the expenditure during 1884 amounted to £37,000; and now, without taking into account the value of the sites, granted by the Government for educational purposes, which are very valuable, the Department holds school property estimated to be worth £205,000. The cost of State education per child per annum, including departmental and all expenses, was found to be, in 1884, £5 7s. 8½d. But this does not exhaust the expenditure of the State on behalf of education. The various grammar schools of the colony received as subsidies and endowment, during 1884, the sum of £7,000; exhibitions and scholarships, £2,180; technical education, £600; museums, £2,400; and orphanages, £14,912. The gross expenditure amounting, according to the last return, to £177,489 15s. 10d., a sum that speaks well for the liberality of our Legislature and the prosperity of the colony; for in proportion to our revenue and population, the money spent bears favourable comparison with the amount expended in any other country.

PROGRESS AND RESULTS.

The present Act came into force on the 1st of January, 1876, and at the end of that year there were 262 of what are technically known as school departments; and there were 689 teachers and 36,271 scholars enrolled during the year. The salaries and allowances for the year amounted to £56,673 12s. 9d., and building expenses to £7,091 16s. 2d. At the end of 1884, the figures were as follows:—School departments, 424, teachers 1,152, and scholars enrolled during the year, 52,556. The salaries and allowances had increased to £102,320 6s. 3d., and the building expenses to £36,940 9s. 4d. The departmental and inspecting branches of the service have correspondingly increased. As far as results are concerned, these may be seen in the general education diffused throughout the whole population; the illiteracy of past days is gradually being wiped out, and our colonial youths are now standing abreast of those educated in older countries. Year by year, the standard of education will be raised and further acquirements will be demanded from the teachers. It is recorded that when a traveller, who had missed his way, happened to come to a place where a gallows was standing, he rejoiced that he had again found his way within the borders of civilization. As one result of education in Queensland it may be said that it would be difficult for a traveller to hit upon a spot in the colony where any number of residents could be found, without happening upon that certain sign of civilisation—a State school. That juvenile crime has been repressed so far is mainly owing to universal education offered to the youths of the colony; and those of our legislators who reckon

it wiser and cheaper to educate and preserve, than to punish and reclaim, can be fully justified in their conclusions by an appeal to our criminal calendar and to the moral condition of the people. Queensland youths are not criminal in their tendency, and while the prosperity of the colony may account greatly for this, our educational system has had something to do with it in teaching the young the way they should go, and training them to walk in it. Probably the best proof of the excellence of our system, and the efficiency with which it is worked, is the fact already stated, that our State school scholars more than hold their own when pitted against those whose education has been given at grammar and other schools, and who, when they enter upon the wider field of university life, take up, after hard contests, positions of honour, and carry off prizes of merit. It is not only in scholastic circles that we find these evidences of good results, but, as we look around, we find that the rising men in our professions, in our businesses, in our factories (and we hope soon to say, in our politics), are those who have been fitted for life's work and fight in the State schools so munificently provided for by our Parliament, and who have passed from these on to grammar schools amply endowed and liberally subsidised by the State. Queensland may well be proud of her immense territory, her rich resources, her magnificent climate, her varied products, and her progress in the past and greater probabilities for the future,—but there is nothing that she has cause to be prouder of than her educational institutions, the foundations of which were laid by wise and thoughtful men in the past, and the superstructure of which is now being built up by men well qualified to be the successors of those who did such good work in the years gone by. One thing is wanting to crown the edifice, and that is a University. Already a movement is made to gain this desired object; and there can be little doubt that the men who achieved such success in the past, and those who are reaping it in the present, will prove equal to the task of founding a Queensland university, so that within our own borders we may have the means not only of commencing a good education, but also of finishing it with all the perfectness and polish of older institutions; and also the power and privilege of giving to Queensland degrees a status inferior to none in the world—thus stamping our own rich material with our own Hall-mark, and rendering it no longer a necessity for our students to migrate to foreign institutions before they can have the seal and signature of their acquirements and take their fitting place among the scholars and scientists of the day. Until this institution is opened our educational system will be incomplete and so far a reproach. Happily the means and money for establishing it are within our borders, and if our Legislature will extend its liberality in this direction the wealthy of the colony will be found, it is hoped, ready to help in giving the one thing needed to perfect our national instruction—a Queensland University.

THE COMMERCE AND INDUSTRIES OF QUEENSLAND :

BY
HORACE EARLE.

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THE COMMERCE AND INDUSTRIES OF QUEENSLAND :

By HORACE EARLE.

INTRODUCTORY.

IN the early days of this portion of Australia, now known as Queensland, the trade done could scarcely be classed under the head of commerce. There were people, few enough indeed, who required stores, and there were merchants in Sydney who could supply them, but the trade was so small that a single schooner, trading between the ports, was sufficient for the carrying trade. But with the withdrawal of the convict element free settlement was encouraged; and a gradually increasing business was done, which tempted the directors of the enterprising Hunter River Steam Navigation Company, now so well known as the Australasian Steam Navigation Company, to lay on a steamer between the ports, even in the face of great opposition from a very large and influential section of shareholders, who could see only loss in the enterprise. The "Shamrock" was the steamboat selected for the new service—a tiny boat of 211 tons, the captain of which was supplied with a manuscript chart of Moreton Bay. But she proved too large for the trade of 1842, and after a few trips, covering about five months, she was withdrawn. The objecting shareholders were right—a loss had accrued. Nevertheless there were all the elements of prosperity in Moreton Bay, as the port of Brisbane was then called, and southern speculators had their attention fixed upon the rich soil and luxurious grassy plains of our scrubs and downs. They saw that therein were the "potentialities of growing rich beyond the dreams of avarice"; and these potentialities would almost raise a dead speculator from his grave. Numbers of persons following in the wake of Cunningham, the first "overlander," wandered from their old southern settlements to find prosperity here. Names still revered among us are in the list of the stout pioneers who boldly ventured, with their lives in their hands, into our grassy wilds, bringing with them their flocks and herds, and stirring into life and active producing power this hitherto undeveloped land.

And so once again an attempt was made to connect the prosperous town of Sydney and the gradually rising settlement of Moreton Bay, by steam. The "Shamrock" was seen once more upon our waters, and this time with better prospects of success. The steam company were determined to force the trade, and their enterprise was rewarded; for shortly afterwards we find another steamer, the

"Sovereign," placed upon the line. So certain now were the directors of the company of eventual success, that they secured river frontages in Brisbane, and supported with the utmost liberality every scheme for the advancement of the new settlement.

Brisbane then was but a poor place—a mere clearing reserved from the primeval forest. Standing in Queen street, the principal thoroughfare of the metropolis of our sturdy young colony, one can scarcely realise that ever its hills were silent, or its surface green. On either hand we behold structures rivalling in magnificence those of the older cities of the South. We observe evidences of wealth, refinement, and enterprise, wonderful for the age of the place. Enormous warehouses and shops are distributed on every hand, and are visible in every leading thoroughfare. Banks, insurance offices, and Government buildings adorn the city, and testify to the opulence and commercial vigour of its inhabitants.

Formerly a part of New South Wales, Queensland became a separate colony in the year 1859, at which time its population was estimated at about 20,000 souls. Even then its trade was not inconsiderable, for the Government statistics for the first year of its independent existence place the imports at the respectable figure of £742,023, or about £30 per head of the population, while its exports are recorded at £523,476. This consumption of imports at £30 per head may seem heavy, but it must be borne in mind that prices of most goods at that time were higher than at present. That this was the case was evident from a comparison of the result of the present figures, for we find that the imports for the year 1884 amounted to £6,045,026, while the population stood at 309,600 souls, giving about £19 10s. as the annual consumption per head of population; and yet the luxuries of life enter far more freely into our general habits now than in those rough old days. The trade of the colony for several years was left in the hands of but few commercial houses, some of which are yet recognised in the business of to-day. Outside of Brisbane, with the exception of Ipswich—then of even greater commercial importance than the metropolis—there was but little done, and a few country storekeepers, scattered here and there in squatting districts, supplied local wants, and formed centres around which were to gather future townships.

THE PASTORAL INDUSTRY.

The year 1859 is to be ever remarkable in the history of Queensland as the year of its birth. The population was small, numbering, as I have stated, but little over 20,000 souls, while its area was vast enough for any empire, covering 668,224 square miles, of which it is estimated that not more than 2,000 acres out of 80,000 alienated from the Crown, were under cultivation. The principal crop was maize, followed by potatoes and oaten hay, at a long distance. Banana cultivation was carried on pretty extensively, and occupied about one-fifth of the cultivated area. The live stock was estimated at 23,504 horses, 432,890 cattle, and 3,166,802 sheep. The Queens-

land historian, Mr. Coote, who is responsible for these estimates, values the live stock at the time at £2,500,000, and the "properties comprised within the municipalities of Brisbane and Ipswich at the then current rates, at £900,000, and the gradually growing townships in the interior—seven in all—at £350,000 more." These figures added to the estimated value of runs, and "the movable property employed in industrial processes," would total up to about £4,250,000, which represented the actual wealth of a community of 20,000 souls. These estimates are interesting, and contrast remarkably with the present values, which will be given as we proceed.

Having thus briefly sketched the condition of the colony at its start, I will now proceed to consider its present position, introducing from time to time such information as I am able to command regarding the several items of commercial importance.

The vicissitudes of climate have not been without their effect upon the yield of some of our most important staples; our wool exports for the year ending in December, 1884, were seriously affected by the long continued drought, during which an immense number of sheep were sacrificed, and their fleecy yields lost to the country. The figures before us, however, are not inconsiderable, and shew an enormous increase upon the exports of 1860 when the first returns were made; for while in that year the export value of wool was only £444,000, that of last year reached the large figure of £1,889,000, and that in the face of a calamity which destroyed millions of sheep. Such losses as accrued to commerce during the prevalence of the drought would have created in times past a state of things which the country must have sunk under; but it has outlived weakness, and can withstand the effects of even extraordinary trials. Our varied industries fill the gap created by the depression of any particular one; and although we do not accumulate the wealth an entirely successful season would have produced, we are fortunately enabled to tide over the effects of those disastrous ones which now and then overtake us. Even as it is, the wool produce for the half-year ending June 30 last showed a marked increase over the corresponding period of the previous year; the drought continuing still to almost decimate the flocks.

The infliction, however, has not been without its lesson, and wool-growers are profiting thereby. It is a proven fact that beneath the surface of our widely extending plains there are immense natural reservoirs of fresh water, which only require expenditure in money and labour to develop. In many cases works of this nature have been locally undertaken to the advantage of the stock-owner, who may now almost defy the fiercest drought. This endeavour to counteract the effects of this great scourge is warmly supported by the Government, even to the extent of establishing a special department, and instituting a series of experimental borings which have, so far, proved remarkably successful. There can be no doubt that visitations in this respect will in future be far less disastrous than in the past; and it is only a matter of time for droughts to be looked

upon without the dread of the ruin which they have heretofore brought with them. I mentioned above the estimated number of cattle, sheep, and horses in the colony at the date of separation from New South Wales, and now proceed to give the figures, from the last published returns, showing the numbers as they now stand :—

Cattle	...	...	...	...	...	4,266,172
Sheep	...	...	...	...	...	9,493,829
Horses	...	...	...	...	...	253,116

Taking into account the epormous losses through drought, which could only be roughly estimated, this is a large increase upon the original returns, and is a satisfactory proof of the suitability of our climate for pastoral pursuits.

In connection with this industry it may not be out of place here to contrast the past with the present as regards the value of exports :—

	1860.	1884.
Hides	£10,000	£92,600
Skins	3,700	16,000
Tallow	25,000	76,000
Wool	444,000	1,889,000

But even this does not show the increase in actual numbers, for 25 years ago prices were throughout much higher than they range at present, and a very considerable per centage might be added to the present figures to place the actual exports upon the same level, item for item, as in the 1860 returns. And again, there are thousands of bales forwarded by squatters—on or adjacent to the border—to Sydney for shipment, which therefore do not come into our customs' returns. But on the other hand the greater care which has been bestowed upon the breeding has, no doubt increased the weight of fleeces, so as in some measure to reduce the discrepancy caused by the alteration in prices.

The present decline in the price of wool shows cash returns which are inadequate to the cost of producing ; and, considering the increase in production and quality in other wool-producing countries, an advance of any magnitude cannot be looked for with any certainty. Nevertheless it will be many years before wool of equal quality to Australian wool be produced in foreign producing countries, our soil and climate being peculiarly adapted to the growth of the finer sorts, namely, the fine combing Australian merino, to the cultivation of which our growers should give increased attention.

Taking the next item of export in value we come to the—

THE SUGAR INDUSTRY.

A long series of experimental efforts at length resulted in sugar being placed on the list of our products. The coffee and sugar Act of 1862 brought this about, and large areas of suitable land were placed under cane. Later on—some four or five years—when it was proved beyond doubt that sugar could be grown profitably in Queensland, many more sanguine investors became inspired with the idea of becoming planters, and spent immense sums in machinery, clearing,

planting, &c., and also invested in the labour considered most suitable for such work. But unfortunately for most of them, their labours were of too experimental a character, and the expenses proved too heavy for their pockets. Machinery of an expensive kind was purchased, and, for lack of knowledge of the subject, was in many cases useless to the purchasers. At that time the price of sugar was such that a yield of any importance, if obtained, would have met almost any outlay the planter may have been at, but for want of proper cultivation the yield did not appear, and thousands of pounds were thereby lost. This failure was most apparent in Southern Queensland, although it was not unknown in the tropical districts of the colony. People persevered, however, and at length acquired that knowledge of the subject which enabled them to work their plantations with some approach to success. The first official returns show that there were six mills in operation, and that the united crushings were 168 tons, and a large quantity of molasses. This was in 1867. In 1872 there were 65 mills, crushing 5,000 acres of cane for 6,266 tons of sugar, and 357,614 gallons of molasses. Still progressing, in the returns for 1882-3 we find there were 120 mills with a crushing of 15,702 tons of sugar, and 663,825 gallons of molasses. The returns since have shown a constant increase, and at the present time, with prices depressed quite one-half, the value of our sugar returns may be estimated roughly at £1,000,000, inclusive of that consumed in the colony. The difficulty in getting cheap and suitable labour is almost overwhelming at the present time, when the price of sugar but little more than pays the cost of production. This industry has now assumed such gigantic proportions, that the returns, under favourable circumstances and with all the mills in full work, have placed its export value next to gold. We still hope to see it profitably worked, without shocking the prejudices of any class.

The sugars produced by our best mills are of a very superior description, being well made, with good grain and colour. The large sugar-mills of Yengarie, which were established about 1872, for a long time produced the best and most marketable samples; indeed although rivalled by the produce of some of the more northern mills, their sugars still command the highest prices. The principal sugar districts of the colony at the present time are the River Mary, Bundaberg, Mackay, Mourilyan Harbour, and the Johnstone River; other lands are equally good, but the present depressed condition of the sugar market has prevented its being worked.

BANKS.

Before 1859 but three banking institutions had established themselves in Brisbane: the Bank of New South Wales, the pioneer bank, which struggled for business as far back as 1850; the Union Bank, which opened in 1853; and the Australian Joint Stock, which opened in 1856. The Bank of Australasia had located itself in the then important town of Ipswich in 1853, and shared the financial business of that town with the Bank of New South Wales, which opened there

at the same time. These great establishments had to content themselves with small beginnings, but have grown with the growth of the city, and are now possessed of buildings of vast magnitude, though not too large for the business transacted within them. As the commerce of the colony progressed other banking corporations followed in the wake of the three just mentioned, which we name in the order of their establishment here:—

The Commercial Bank of Sydney	...	...	1862
The Queensland National Bank	...	...	1872
The London Chartered Bank of Australia	...	...	1882
The Mercantile Bank of Sydney	...	...	1884
The Commercial Bank of Australasia	...	...	1885

The Bank of Australasia, which we have stated opened in Ipswich in 1853, found it to its advantage to be represented in the rising metropolis, and commenced business there in 1860. The city of Brisbane has liberally responded to the efforts made in its behalf by these grand institutions, their annual dividends being considerably the better for their Queensland trade. The gradually expanding importance of the colony, its increasing wealth, and spreading industries (of which I shall speak hereafter), offered a fair field for investments, which the closing markets of the western world denied to capitalists, who gladly turned their attention to our increasing capabilities. Through these institutions they have been enabled to reap heavy dividends, to their satisfaction, doubtless, and also to our advantage. Judiciously liberal in their advances, the support of the banks has maintained the commerce of the colony in a sound and satisfactory condition; and has promoted and encouraged the growth of those industries which have given us a permanent claim to be regarded as a wealth-producing colony.

Within the limits of such an elementary paper as this it is impossible to reproduce the elaborate details of their business, as shown in their periodical returns to the Government; but some idea may be gathered from the following summary:—

**For Quarter ending March 31st, 1885.*

	£	s.	d.
Notes in circulation not bearing interest	607,036	1	9
Coined gold and silver and other coined metal	1,167,953	15	9
Deposits not bearing interest	2,298,178	9	1
Deposits bearing interest	3,963,155	2	6
Amount of all debts due to Banks	9,796,888	3	10

These returns speak volumes for the amount of business done in the colony, and therefore need no comment from me. I have at my disposal figures which would show the gradually increasing nature of the banking business in Queensland, but lack of space for such details precludes their insertion; moreover it is sufficient for our purpose to show the present condition of our monetary interests.

* These returns do not include the Commercial Bank of Australasia, which opened after they were prepared.

From the list above given we must extract one Bank for special notice, it being a local institution.

The Queensland National Bank was founded in 1872, and at once secured the position among kindred institutions which it has since maintained. The management struck out boldly and planted branches in every country town as it evolved from the wilderness, and it now numbers no fewer than forty-four. Its liberality induced custom, while the local knowledge of its practical conductors almost reduced its risks to a minimum. The new bank building in Queen street is the most imposing structure in the colony, and leaves little to be desired in the way of accommodation.

MANUFACTURING INDUSTRIES.

The efforts made by the industrial section of the various communities of Queensland to push local work into the front rank have met with the greatest possible success, and our foreign imports are greatly diminished thereby. A good tradesman is invariably successful, providing always that his efforts are well directed and that he devotes himself assiduously to his work. A waster of time drops out of the line and sinks into comparative nothingness, however clever a workman he may be. Ours is a country for the industrious; the idler need look for no success here, but on the contrary will sink lower and lower until he becomes an impecunious loafer. We have amongst us so many examples of successful industry that it may be safely asserted that fortune will favour the industrious. Men who have started in life with their skill and energy as their only capital are now become wealthy capitalists and the employers of hundreds of hands. Of these I propose to give instances as I proceed, and in doing so I may fearlessly hold out the hope of a like future for all who put heart and head into their work. Unfortunately we are not without our share of thriftless, idle loungers, who shuffle through existence in an aimless manner, and ultimately disappear without leaving behind them any greater lesson than that afforded by the utter failure of their lives. Perhaps the most important industry cultivated amongst us is the mechanical, and this affords us so many instances of successful enterprise that I shall place it first.

FOUNDRIES AND IRON WORKERS.

The oldest foundry in this colony is that now owned by the firm of Smith, Forrester and Co. It was originally started some twenty years ago by a working man of the name of Cameron. His business was small, of course, but it gradually increased under the subsequent guidance of Mr. John Sinclair, late Mayor of Brisbane, and was purchased in 1868 by Messrs. Smellie and Co., who conducted it most successfully, and finally sold out to the present proprietors. These were three hard-working, steady mechanics who had made up their minds to thrive. Commencing business in a small way in 1873, starting with tools which their own ingenuity devised and skill manufactured, they laboured on, and within a month of their starting

found employment for twelve men. Soon their business so increased that they found it necessary to search for larger premises. About this time, 1882, only three years ago, Smellie and Co. decided to relinquish their foundry business, the two firms came to terms, and Smith, Forrester and Co. entered upon the extensive premises which they now occupy, where they employ about 200 men. So rapidly is their business extending that they have secured land a few miles down the river, where they purpose to carry on the shipbuilding business, which they are so actively engaged in. Theirs has been one unbroken success, and the magnitude of their operations has never proved too much for their powers. Their arrangements have permitted them to engage in extensive contracts, including the building of steamers; and when their yards at Breakfast Creek are completed, no vessels could be too large for their resources.

Messrs. J. W. Sutton and Company's establishment is at present even larger than the before-mentioned, and gives employment to 300 hands. Beginning in a small way, this firm has now become the most important in Queensland in its line. Their works are very extensive, and are equal to any demand made upon their resources. Machinery of all descriptions, and steamers of all sizes are constructed in their workshops and yards; the work in all cases being in the highest degree satisfactory. Their capabilities are unlimited; and whatever may be done by skill and capital may be safely undertaken by this vast establishment, which has now become one of the institutions of the colony. From a small beginning—the very smallest imaginable, only a few years back—the establishment has grown into its present vast proportions, and its heads are among the wealthy of the land. Since 1881, when this firm may be said to have commenced, they have built eleven steamers for private purchasers, have constructed a large number of sugar plants, and completed a considerable quantity of rolling-stock for the Queensland Railways, and have now on hand orders for four steamers averaging 60 tons register, and twelve hopper barges. As soon as possible, this firm intends to avail itself of the greater convenience offered by their extensive area on the river bank, about four miles down the river, when they will construct a patent slip.

Still other instances of well-earned prosperity press forward for our consideration. Messrs. Evans, Anderson, Phelan and Co.—pushing, industrious, and intelligent workmen, bred at the forge, the anvil and the lathe—dusky workers, amidst smoke, heat and noise—issuing forth to secure the premiums their untiring industry has won for them. Here again the busy hum of labour arises from the united efforts of begrimed and stalwart workmen, numbering some hundred and fifty strong, who work at the boiler, the engine, or the steamship; the sugar-mill, the quartz-crusher, anything that iron or steel can be turned into, or that mortal engineer can fashion.

Then come Harvey, Sargeant and Co., a year or two since earning wages in other shops, and now masters of their own with thirty men at their command, casting huge girders, or fashioning graceful pillars

and railings, for the huge buildings springing up around us. But a little while since such goods were brought from the other colonies, or from England. Their manufacture was beyond our hope or expectation; now we give our orders to our fellow citizens and are satisfied with the quality of the work supplied, and care not to go outside for what can be so well done here. Many smaller shops exist, and in time they will, in turn, become enlarged, and their patient industry shall be rewarded.

In Ipswich, in Toowoomba, in Bundaberg, the busy workshops resound with the stroke of hammers, the hum of men, and buzz and whirl of engine and connections. In Maryborough the great firms of J. Walker and Co. and Tooth and Co., employing some 350 hands, turn out such work as would do no discredit to the great shops of England. Dredges, barges, steamers, iron lighters follow each other from the busy ways, and glide into the element which is to be their home. Robertson and Co., of Mackay, with sixty busy men, labour to meet the demands of the great sugar district in which they are located. Making and repairing, this busy shop is ever astir with noise and bustle, each man adding wealth to the long-headed Scottish foundryman's teeming purse. Townsville has its Foundry Company with forty hands, each busy supplying the demands of the vast district around them. Indeed, in all parts where such work is needed, may be found evidences of successful progress and unwearying industry. The faithful worker is always well above the level, is always comfortable in pocket, and beyond the reach of those petty trials and shifts which are so markedly characteristic of working life in England.

BRASS AND COPPER FOUNDRIES.

We have also brass and copper foundries, the chief of which is the establishment of Messrs. J. Hipwood and Co. Commencing in 1870 with two workers, we now behold works equal to any possible demand, and in which are constructed large plants for distilleries and breweries, also Baur and Wetzell pans. A great portion of their trade at the present time is with the shipping, on which they are constantly engaged, the mail ships keeping them always going. The work turned out by this establishment is first-class, and in every respect equal to imported.

GALVANISED IRON WORKERS AND PLUMBERS.

One house finds very profitable work in galvanising. Messrs. W. Keith and Co. are an old-established firm, but until lately have confined their business to tinsmithing and galvanised-iron working; they have now, however, added galvanising to their business, and their work is so satisfactory as to command a very large portion of the trade, to the exclusion in a great measure of imported goods.

Galvanised iron workers and plumbers are very strongly represented in the colony, each town of any importance having its quota. The industry is a paying one, and it may be safely said that every house is successful, while most are wealthy.

SADDLE AND HARNESS MAKING.

Saddlery and harness making is also a profitable industry here, and its representatives in a wholesale way are a thriving people. The workmen are the best procurable, and turn out work quite equal to imported. The establishments of the local makers give employment to a great number of hands who are all well paid. Toowoomba, the centre of a rich squatting district, gives business to a large number of makers. Rockhampton, Townsville, and Maryborough—important Northern centres—are well provided in this department of trade. Dating back almost to the origin of the colony, the principal firms have, with the aid of the best hands procurable from all parts of the world, worked up into wealth and station.

BOOT MANUFACTURING.

The boot-making trade is carried on very extensively. The wholesale manufacturing is of course not in many hands, but the amount of capital invested is very large. There are two leading establishments which I shall mention, space being too limited for further dilation on this branch of our commercial development.

The establishment of Mr. James Hunter is remarkable for its vastness; the manufactory, five stories high, stands upon nearly an acre of ground, with a total area of some 47,700 feet; and employment is given to 450 hands, embracing every class of boot workmanship. The output is stated to be about 60,000 per week—an enormous quantity certainly, and one would think ample for the wants of the 320,000 inhabitants of this great colony. Mr. Hunter, however, not only manufactures for our wants, but sends forth his work into the other colonies, where it is highly appreciated.

The next important manufacturing house in this trade is E. T. Neighbour's. This establishment started about ten years since with four hands, and by dint of unwearying industry and energy it has now increased to its present enormous proportions. The number of hands employed at the present time is 200, each of whom, under the careful supervision of an able manager, seems to turn out excellent work. The factory is large and roomy, well ventilated, and clean; while the evidences of an extensive trade is visible all round. This factory turns out 300 different sorts and styles of boots, and is certainly very creditable to our young colony.

CABINET-MAKING.

Cabinet-making is a well established and thriving industry, its representatives being scattered about throughout all the large towns of the colony, the metropolis, however, naturally attracting the best workmen, and boasting of the larger establishments. The work turned out by them is certainly unsurpassed in quality and taste by any imported goods, while the establishments would do credit to any city in the world. Imported goods in this and, indeed, any other line, labour under the disadvantage of being made for Australia; that is to say, they are poorly finished and decidedly unreliable in point of durability. Our local men are striving to establish preeminence in all

branches of trade, for their reputation is their fortune. It is sufficient to say that there is no occasion whatever to go outside of our own workshops for most articles in this category. The lighter and more artistic branches of cabinet-making are by no means neglected in our advancing industries. Magnificent show-cases, elaborate and exquisitely finished and designed fret-work, and ice-chests of perfect construction are produced here. Perhaps the most artistic among his many rivals is Mr. P. Thomle, whose works are most thoroughly interesting, from the beauty and grace of the various works with which his workshops are crowded. So greatly is his work approved, that he has been awarded medals of high value from most of the exhibitions. This gentleman commenced, of course humbly, seven years ago, and now employs twenty highly-paid men.

COACH-BUILDING.

That the refinements and luxuries of life are not absent from our social condition may be proved by the enormously increasing development of the coach-building trades in our midst. Where but a few years since an occasional buggy might have been seen, and that of the humblest and least pretentious description, we now behold carriages by the hundred, and many of them equalling in style and finish the stately vehicles of the famous "Row." Our beautiful suburbs are alive with them. They shed a lustre of refinement and grace on our capital, and make us hopeful that in course of years our Queensland metropolis may vie with other capitals in everything that softens and elevates labour and struggle. The oldest coachbuilding establishment in the trade started as a blacksmithy and wheelwright, as far back in our dark ages as the year 1843. With patient industry and untiring energy, L. McLean plodded along until he was enabled to leave to his son, the present head, a business employing some forty hands. The present business is of a mixed nature, and includes the manufacture of agricultural implements, in which department Mr. A. McLean has achieved great success. The present shops are found to be too small for the work to be done, and larger premises are being erected about a mile from the centre of the city.

Another old firm stands in the front rank in this department of our local industries. The firm of J. McNab and Son commenced in a very small way in the year 1854, and have now achieved a reputation which is an honour to the firm and the colony. They have managed to keep up with the times, and the work turned out by them is in most respects cheaper and better and as well-finished as any imported goods. They do no heavy work, confining themselves entirely to the construction of carriages.

Mr. P. Troy must not be omitted from this category of successful workers. A blacksmith and wheelwright by trade, he commenced business in a very small way in 1867, and has gradually worked himself up into wealth and consideration. His workshops embrace every class of vehicle, from a tip-dray to a carriage. He, also, gives work to a large number of men.

Mr. W. Edds commenced business with forge, hammer, and a blacksmith or two in 1861, and gradually expanded his business, until now with forty hands he is enabled to turn out carriage work in all its branches. His cabs, carriages, omnibuses, dog-carts, and what not, may be seen all over the colony, and are proved to be of a quality unsurpassed by any imported articles of the kind.

Our coachbuilders are an active and industrious class, as well as most excellent tradesmen. Closely following the march of improvement, the character of their work will bear the closest inspection, and few strangers visiting Brisbane could guess that the highly-finished carriages flitting here and there through our streets were not made in Long Acre or Oxford street. There are many other makers whose works are highly esteemed; indeed, so excellently do all our coachbuilders turn out their work that it is almost invidious to particularise, and we have therefore confined our notices to the oldest establishments. There is one thing certain in connection with this branch of our trade, that we do not need to go abroad for our supplies.

POTTERIES.

Our potteries are also strongly represented by A. Fischer and Co., the Dunmore Brick and Tile Company, and others, who produce articles in every way equal to the imported. In the porcelain and crockery branches, of course, we have no works; our discovered clays not being equal to the production of such delicate and fragile ware. Still, if attention were turned in this direction, I am of opinion that in course of time suitable clay could be found, and our intelligent operatives would turn it to excellent account.

TANNERIES.

We have several large establishments in this branch of our industries whose work is eminently satisfactory, and these works exhibit to a large degree the skill and energy which our colonists devote to any undertaking to which they may give their attention. By way of illustration, we adduce one or two instances in this line. The Graziers' Butchering Company erected their works about two years ago at Esher, a few miles from Brisbane. They chiefly make light leather, quantities of which they export to England; the principal boot factories of Queensland are supplied from this establishment, as well as the manufacturing saddlers. It is noticeable that their bridle leather is quite equal to English, and that therefore its importation in quantities is rendered almost unnecessary. Their works are very extensive, and a large number of men are employed therein. Their fellmongery establishment is very successfully worked, and the export of wool therefrom reaches a large total. The Leather Company, Limited, is another important concern in this branch of trade, having extensive works at Lutwyche, a Brisbane suburb. The third of the principal tanneries is that of W. Stephens, the oldest house in the trade, and one highly esteemed for the quality of the work turned out.

FOODS.

We now pass to those manufactures which may be classed under the general heading of the food section of our varied and rising industries, and the first that occurs to our mind is the biscuit factory of Messrs. F. W. Wilson and Company, of Brisbane. The house in question cannot pretend to rival in vastness the great English houses of Huntley and Palmer, or Peak, Frean and Company; but as regards the quality of the work produced it certainly is in every way equal. The establishment is one of which Queenslanders may be justly proud; and as it is sufficiently extensive to provide for all our wants in this direction, and as its manufactures are so pre-eminently superior to many imported goods of the class, we cannot but feel that in course of time importations will be unnecessary. The varieties manufactured by this energetic firm are limitless, and render selection a task of difficulty from the very abundance of the samples. George Hiron, of Toowong, an extensive suburb of our metropolis, is also a large manufacturer in this branch of our industries; there are also others, but space forbids their mention.

FRUIT-PRESERVING.

Of fruit-preserving works and jam manufacturers we are not without representatives, and most excellent goods are produced, and both as regards quality and price they are every way equal to imported. Some large works are now in active operation, the chief of which are those of McLeod and Wills, and B. Skinner. In this industry we are quite in a position to ignore foreign makers; nevertheless good foreign brands find a good sale here.

MANUFACTURING CONFECTIONERS.

Manufacturing confectioners in Brisbane and other towns of the colony have certainly laid themselves out to rival imported manufactures, and are gradually working their way into public esteem. The large works of Messrs. W. C. Green and Company are worthy of a few special words. Devoting themselves entirely to this branch of trade, they have succeeded in winning their way into the foremost position. Their business has progressed under careful management, and they now employ a very large number of first-class hands. Every department of the trade has been carefully worked up, and they are now in a position to supply the colony with all that may be desired in the way of confections. Through their exertions a large industry has been carefully fostered, and paying employment has been found for immigrants who would otherwise have wandered off into less remunerative occupations.

DISTILLING.

The immense amount of sugar now manufactured in this colony permits of an extensive business being done in the different products of distillation therefrom. Brisbane, Mackay, and other sugar-growing districts all have their several distilleries, and have achieved renown for their products.

BREWERIES.

One industry which has now secured a firm grip of the colony, and which seems likely to maintain it, is the brewery. It is now some years since the first brewery was started in Queensland, but since then the growth of the industry has been rapid, and Brisbane alone lays claim to three wealthy and highly profitable concerns. The oldest establishment of the kind is that of Messrs. Perkins and Co. (Limited), a highly flourishing firm, doing an enormous business, and possessing premises worth a fortune in themselves. The very name in connection with beer should recommend it to the public taste; and yet there is no doubt that Perkins and Co. (Limited), and Barclay, Perkins and Co., of Bankside, are widely different establishments. The next established brewery is that owned by Fitzgerald, Quinlan and Co., and better known as the Castlemaine Brewery. This also does an extensive business, and has acquired a renown for its beer. The third brewery is the Queensland Brewery Co., the youngest born but still a very thriving child, and one which, young as it is, is running its elders very closely. Such beer as that brewed by these great companies, and also by the Gympie and Townsville breweries, is bound to materially affect the English beer imports—indeed it must have done so already, for our beer imports show no marked increase, although the colony's population is constantly increasing. Numerous hands are employed in these works, which have considerably relieved the labour market.

COAL TRADE.

The coal trade of the colony must not be omitted from our list of industries, as it has become a source of wealth to the community, besides absorbing a large number of hands. The great collieries of Ipswich and its neighbourhood are now making their mark in the business of the colony. To enter into details respecting the consumption of the coal raised from these mines would press too heavily upon the space at our command, but the output is certainly increasing and runs into many thousands of tons annually. Besides the coal raised within a radius of twenty-five or thirty miles of the metropolis, coal is being discovered in many places; and in the course of a few years our exports will be largely increased by this industry.

WOOLLEN MANUFACTURE.

Some few years ago a company was formed in the town of Ipswich for the manufacture of tweed cloth. For a long time it languished, and it was feared that the scheme would collapse; but a little more energy and better management succeeded in restoring it, and the industry may now be said to be in a flourishing condition. The material manufactured is of excellent quality, while the variety of patterns and colours enables the directorate to gratify all tastes. We can foresee an important future for this branch of our commerce, and have faith in its ultimate development and the eventual introduction of other branches of textile manufacture.

NURSERY AND SEED BUSINESS.

The advance into the realms of taste and refinement has been most certainly aided by our interest in the botany of our own colony and that of the outside world. Our gardens are by no means the most insignificant evidence of our progress, and our tastes have been fostered by those of our industrial population who have made this subject a specialty. The firm of Messrs. A. J. Hockings & Son have a reputation which extends far beyond the limits of the colonies. Established in 1848, when a flower was a rarity indeed, the senior partner devoted himself to the development of botanical taste and science, and established gardens and nurseries in the suburbs for the propagation of tropical and semi-tropical plants; especial care and attention being given to the acclimatization of fruit trees. In this endeavour he was very successful, and we have now at our command fruits and flowers of almost all kinds. The seed business in connection with this establishment is very extensive; and most of the floral treasures which ornament our gardens and tables are due to the civilizing efforts of this firm.

To the extensive development of these several industries Queensland is indebted for the sound and solid position which she now enjoys. They have given occupation to thousands of men who, without such resource, would have wandered away into the bush in search of such work as may have been obtained, and who would, in this time of severe drought and pastoral and agricultural depression, have become a burden on the State. Sufficient justice in the discussion of our position has not been done to those far-seeing workers who, by embarking in settled and well known industries, have found labour for the thousands who have cast in their lot with us. They now find that the skill and energy by which the business of the world is pushed forward can be properly and profitably utilised here in our very midst, instead of being wasted in the desert or the forest. They discover that the money which would, under other circumstances, have been remitted to other countries can now, in a great degree, be circulated here. Thus it is that we are enabled to combat with adverse climatic influences, and to keep business steadily floating. Every penny we can save by diminishing our imports is a gain to the colony, and assists us to tide over the deplorable seasons which have so long oppressed us.

MINERALS.

GOLD.

The year 1866 was a very disastrous one for Australasia, indeed I may say for the world. Some malign influence had operated to destroy confidence, and with confidence, credit and trade—our revenues were at their lowest, our markets were depressed, our energy was dead or moribund. There was silence in our streets, there was stoppage in our works; our shops were empty, and our balances were all the wrong side. The cry arose, "Oh! for a local goldfield." Oh! for anything that would restore life and activity to our depressed and almost

starving population. General ruin seemed to be inevitable. Property had decreased in value; and wages, when there was any work to do, were insufficient to support life with any liberality or comfort; and "things will be worse before they are better" was the most comforting prophecy we could extract from the down-cornered mouths of the unhappy citizens. And so through the whole of that year (during which the establishment known as the Bank of Queensland sank never to rise again), until September of the next year, 1867, when a wandering miner named NASH, travelling in the neighbourhood of Gympie Creek, following his usual occupation of "prospecting" for gold, came upon the precious metal. In course of time the news of the discovery was wired throughout the length and breadth of Australia, at any rate wherever the wires could carry them; a "rush" ensued, rich gold was struck; Gympie, one of the richest fields in Australia, was an accomplished fact—and Queensland was saved! From this goldfield an almost fabulous quantity of gold has been obtained, which has enriched numbers; while the town itself is an extensive trading centre. There followed upon the discovery of this goldfield an extensive exploration, which has resulted in the opening of several other rich gold centres, from which large returns are constantly recorded. This industry has developed a busy share market, which has its brokers in the metropolis and every mining town in the colony. Even as far back as 1859 our statistics showed an export of gold; the quantity recorded for the year 1860 having been valued at £14,500, while that for 1884 was valued at £1,077,314, a falling-off from the exports of 1876, which were valued at £1,427,000. This of course is exclusive of the large quantity removed without report by Chinese miners on their return to their own country. The past year, however, promises to exceed the yield of 1876, and will take first place on the list of exports. At the present time the mines are very active, and are yielding very freely; and fresh discoveries of the precious metal are being constantly made. The total yield of gold from all mines to December 31, 1884, was 4,529,280 ounces, valued at £15,852,480.

TIN.

This metal, though richly scattered throughout many regions of our extensive area, was not discovered until 1872, when the country went mad over it. The excitement caused by its discovery at Stanthorpe was only equalled by that of gold on Gympie; it also appeared when trade was depressed, and people were looking about them for profitable employment or investment. For some years the mines were worked spasmodically, as companies could be conveniently formed, or as conveniently wound up. Immense sums of money changed hands in these investments, many of which were of the shadiest character. But eventually, the excitement over, the district settled down into a permanent condition, and the yields became steady. In other districts in the colony this metal has been found in even larger quantities—notably in the North—and at the present time, with all the froth blown away, and the mines settled into systematic working, the export

value is considerable; the 1884 table of statistics placing it at £228,000. For years the gradually diminishing price in the home market somewhat crushed the industry, but better appliances having been obtained for working the mines, though still imperfect, and the price having somewhat recovered, they are now working to a profit, and add materially to our wealth. There are several extensive smelting works in connection with our tin production, which are admirably managed, and enable us to ship our product in the form of ingots, instead of, as heretofore, in ore. Our tin commands a fair price in the English market, and will in all probability retain its position. These mines give employment to a large number of persons, who receive a fair rate of wages, and in some cases entirely support the trade of a town or district.

Other minerals are discovered in our rich soil, which space forbids us to detail, but the tables of statistics give us the following details, which cannot fail to be interesting to whomsoever may be desirous of knowing the character of the mineral resources of this rich colony,

We learn that during the year ending December 31st, 1884, the quantity raised was as under, valued at the mines:—

	Tons.	Value.
Tin	3,383	£130,460
Silver and lead	4,386	35,327
Antimony	748	6,469
Coal	120,727	60,025
Copper	2	17
	129,246	£232,298

From the mines of Herberton, Palmer, Ravenswood, and Star, Hodgkinson, Gympie, Wide Bay, Ipswich, and Stanthorpe.

COAL.

This industry, as will have been seen, is no unimportant one at the present time, and this year's yield will no doubt double the 1884 figures. We look forward to great things from this branch of our mining industries, as the quality of the coal is gradually winning the esteem of consumers of all classes, and our mail service is making free use of it.

SILVER.

The silver yield is also creating a sensation, and the business of the current year will be an enormous increase upon the past—indeed, at the present time, fortunes are being made on the mines, which bid fair to equal some of the richest American successes.

COPPER.

The copper mines in the various producing districts have been seriously affected by the low price of the smelted ore in England and other markets; nevertheless the great Cloncurry mines look very healthy, and great quantities of the ore have been raised, and might be

placed on the market as soon as smelted. Numbers of copper lodes are being found in all directions in this rich mineral district, and only require an improved market to work them successfully. This industry, which might have been one of the most important, is temporarily crushed, as I have stated, by the abnormally low price of the metal; but we may look for restored activity and prosperity in course of time. There is no question of yield, the stagnation is merely a matter of price, and the general relinquishment of active work in the mines will soon have the effect of restoring this.

PUBLIC WORKS.

RAILWAYS.

Our railway system is necessarily extensive, and is being annually added to by liberal votes for the purpose. Our Governments have been keenly alive to the advantages of this mode of communication with the interior, believing justly that settlement would be a slow process without it. The question whether a railway system should precede or follow settlement has received wide discussion, with the result that wherever the prospects of either agricultural settlement or mining operations were sufficiently favourable, a line should be formed, and the district in question be made available for industrial purposes. The gradually increasing and extending railway system is blotting out distances, and the wild deserts of the interior are even now being brought within its influence. Starting from the various busy seaports, the lines traverse hundreds of miles of mining, agricultural, or pastoral country, and remove at once the old trouble of getting the produce to a port.

According to the latest returns we had 1,207 miles of railway completed, and 746 miles in course of construction. Still further work is in contemplation, which will have the effect of rendering the greater part of our vast territory available for settlement. The gauge adopted by the Queensland Government is very narrow, but the engineering skill manifested in the construction of the lines is of the highest order, while the rolling stock, a considerable portion of which has been made in our local workshops, is highly creditable to the skill of our workmen. All this work has been completed at a heavy cost, the amount comprehending the greater part of our loan liability; but the money has been well and wisely spent, and future generations of Queenslanders will have reason to bless the sound reasoning upon which the expenditure was based. And after all, the net earnings of our railways give a return on the annual cost of 3 per cent., which is not so bad considering the small population of the country. With increased immigration will arise increased traffic, both in passengers and goods, and future returns may show an increased profit.

THE POST AND TELEGRAPH DEPARTMENT.

This is now very complete in all its details, and both postal and telegraphic communication are opened with every civilized part of the world. We have not less than 6,979 miles of lines in use, with 11,300

miles of wire, and communication is open with 202 stations throughout the colony ; while the Telephonic Exchange communicates with more subscribers than the constantly increasing number warrants our mention of. Over 300 miles of wire are used for this service.

Our mail services by sea are thoroughly efficient, and we are in almost daily communication with the Southern colonies. The oldest service is that of the Australian Steam Navigation Company which, as I have already stated, opened steam communication with us as far back as December, 1841, the steamer "Shamrock," of 211 tons, being considered large enough for the trade. To this company we are largely indebted for our colony's progress, although, doubtless, the monopoly of the steam traffic was a paying one at the time. Their fleet is now very large, comprehending some of the fastest and best equipped boats on the coast. The success of this company in connection with the Queensland trade, however, produced the usual effect, and other companies competed with more or less want of success, until the Melbourne Steamship Company organised an opposition line, which has managed to hold its own against its powerful opponent. Meanwhile the largely increased intercolonial trade warranted the introduction on the coast of an efficient opposition, and we are now greatly benefited thereby. Watching closely the requirements of our commerce, these active and well-managed companies have in many cases anticipated our wants.

The large fleet of the Melbourne Steam Shipping Company (Messrs. Howard Smith and Co.) find profitable employment on our waters, and have largely increased the business of our ports. In addition to these two wealthy and influential companies, we have the Queensland Steam Shipping Company—an intercolonial service established under the auspices of the British-India Steam Navigation Company, and managed by that body. Its steamers are large and swift, and find ample occupation both in passenger and goods traffic. These lines of steamers maintain a pretty constant connection with the other colonies, and link us with the huge foreign mail services which have their termini in Sydney. With our own mail service, *viâ* Torres Straits, we are thus able to communicate with Europe and all the rest of the world six times per month.

The British-India line, subsidised by our Government for postal and immigration purposes, has been most successful in promoting the commercial interests of our colony ; and to its introduction may be traced the vast increase in trade which has so marked our later years. By this grand scheme the whole of the ports north of Brisbane have benefited, and direct communication has been opened with countries heretofore closed to us. The introduction of a direct service of trade between this port and Calcutta is now contemplated—indeed, we may say the scheme is gone beyond mere initiation—for the large steamers of the British-India Company are actually laid on, and will shortly appear in Queensland waters. It is clearly evident that capital casts loving eyes upon our prosperous colony, and seeks therein for an outlet for its pent-up stores of wealth. The merchant-fleets of the

world will be soon striving for a share of our trade, and then we shall begin to feel the pinch of a small and thoroughly inadequate population.

Under the auspices of an influential concern—the New Zealand Loan and Agency Company—direct steam communication has been opened with New Zealand, while Tasmania has found it to its advantage to send its produce direct, instead of through Sydney or Melbourne. On all sides we see public and private effort extending our communication with the outer world, and our Post Office authorities are by no means slow in taking advantage of the opportunities thus offered for increased postal connection.

Our inland postal arrangements are fairly complete; indeed, considering the primitive methods which have to be adopted to get at some of the backwood stations, it is a matter of wonder that letters do not more frequently go astray. The railway is, of course, availed of to the extent of its possibilities; over 5,000 miles are served by coach, and horses are utilized for nearly 18,000. The inland postal system covers over 24,000 miles, at a cost of £55,000; and the total distance annually travelled is considerably over 3,000,000 miles.

HARBOURS AND RIVERS.

Since the establishment of the colony in 1859, the Government have devoted much money and time to the proper regulations and improvement of the ports of Queensland. The Government of New South Wales had in its time deemed the northern districts of their vast territory altogether beneath their care; indeed the population was so small and scattered that they had really some reason for their neglect. But the young and vigorous Queensland Government had scarcely taken the reins in hand, when they began to take the necessary steps towards the development of the ports. Dotted with sand-banks and shallows, Moreton Bay navigation was a task of difficulty and danger for any vessels of considerable draught, and it certainly was a matter for congratulation when, in 1855, Messrs. Geo. Raff and Company loaded and dispatched from their wharf the "Gazehound," a vessel of 600 tons. The necessity for forming a channel and deepening the bar (which seems inseparable from all Australian rivers) was obvious, and in due course the channel known as "Francis" was formed, and the various flats of the river cleared to such a depth as to permit the passage of ships of large size to the wharves of Brisbane. Still, with the grand object of improving the port, and with a view to the extension of the commerce of the metropolis, successive Governments have laboured to improve the river's approach. A more direct channel has of late been formed of greater depth and width, the river shallows and flats have received proportionate attention, and at the present time ships of 2,000 or 3,000 tons can make the passage to the wharves with absolute safety.

The following extract from the report of the Engineer of Harbours and Rivers, W. C. Nisbet, Esq., will show the extent of the work accomplished in the port of Brisbane to the end of last year:—"The

Bar cutting has been deepened to 15 feet below low water for 200 feet in width; the Inner Bar cutting to the same depth for a width of 150 feet; Pinkenbar Flats cutting, to the same depth for a width of 200 feet; Eagle Farm Flats cutting, to the same depth for a width of 200 feet; and the cutting through the Upper Flats will be completed to the same depth for a width of 200 feet in two or three weeks' time. All these cuttings will be widened to the full intended width of 330 feet in the order that seems best suited for the traffic of the river."

Large sums of money have been spent, and profitably spent, in plant for this and similar work in the other ports of the colony. There are six very powerful dredges, with attendant hopper-barges and steam tugs, constantly at work in one or other port or river, representing a money value of some £314,500. While there are under order, or in course of construction, at the various works in the colony, the following extensive additions thereto, which will bring up the cost of plant to £400,000:—

Twelve 200-ton side-delivering hopper-barges.

Four screw tug-boats of 24 h.p. nominal each.

The above being built by the firm of J. W. Sutton and Co., of Brisbane.

Three 160-ton bottom-delivering hopper-barges.

In course of construction by Messrs. Evans, Anderson, and Phelan, who are also building a new dredge, for which the sum of £30,000 has been voted.

One new dredge, similar to the above.

Five steam hopper-barges of 450 tons each.

Being built by J. Walker & Co., of Maryborough. Votes for the clearing and rendering navigable the principal rivers of the colony are freely granted, and, under the control of responsible and efficient executive officers, the works are, and have been, executed in a most thorough and satisfactory manner.

The deepening of the Moreton Bay cutting, and the various cuttings in the river before-mentioned, are to go on until vessels of the size of the Orient liners or P. and O. Company's steamers can come up to the wharves in Brisbane. These operations are expensive, and are undoubtedly a large drain upon our revenue; but they are remunerative. The trade of our ports is increased, and the inward and outward tonnage dues are enhanced. By such wise expenditure our Government have succeeded in turning a beautiful though valueless port, which at the commencement of the colony could only permit the passage of vessels of small tonnage and the lightest draught of water, into one permitting the free and safe access of steamers of 4,000 tons and a proportionate draught.

In addition to the dredging and cutting operations which, as I have said, have been carried out so extensively and completely, the Government have constructed a graving dock of considerable length,

at a cost of £60,000, for the use of the port. This has been of immense convenience, and its usefulness will grow with the trade of the port. At the present time preparations are being made to lengthen it, and for that purpose the ground within the dock enclosure is being levelled and surveyed. The dock is large enough for present demands, and has accommodated a vessel of 315 feet in length; but with a view to the possible advent of vessels of still greater length, the enlargement is considered advisable and will be at once proceeded with.

Wharves and sheds have been erected at Government cost on so many rivers that space will not permit of detail. Wherever such accommodation has been satisfactorily proved to have been necessary, the Government has ordered the construction. So far, also, as may have been practicable, the rivers have been deepened to admit of their free navigation by the settlers thereon. This work has proved of immense service to farmers and others, giving them the great advantage of uninterrupted water carriage for their commodities and stores.

To give my readers an illustration of the advancement of the business of the port, and to prove that the enormous expenditure in improving it has not been without reason, I have only to mention that the inwards and outwards tonnage for the first year of the colony's independent existence, ending December, 1860, was 84,000, in round numbers, while that for the year ending December, 1884, was 1,152,000, and for the whole colony, including foreign, coastwise, and intercolonial, probably three times these figures.

LIGHTHOUSES.

It is said, and with truth, that the coast of Queensland is the best lighted in the world, and it is a fact that the Government of the colony has expended a greater proportion of its revenues in this very necessary work than any other Government. With a coast line calculated to be about 2,200 miles in extent, furnished with many flourishing ports, and flanked by reefs, rocks, and sand-banks, the navigation is naturally extensive and intricate; hence a system of lighthouses, and other land-marks and danger-indicators, has naturally exercised the skill and judgment of the port authorities, with the result that the navigation of the coast is now rendered safe and simple; the sailing directions, based upon accurate and approved surveys, being available for mariners of all nations. The dangers of the Torres Straits route, hitherto the terror of seamen, are now disposed of, the track being buoyed and lighted throughout, so that vessels can pass through without the slightest risk: for this alone the Queensland Government deserve the thanks of the world. Straits' pilots-men, thoroughly approved by an exact and careful board, are appointed to conduct vessels through the various intricacies of these waters, so that the large steamers which now traverse the Straits, and at all seasons of the year, with safety, prove the value to the various shipping communities of the world of the careful buoying, marking, and lighting of this route.

The following is a list of the leading lights on the Queensland Coast, from Cape Moreton to the Norman River, in the Gulf of Carpentaria:—

Cape Moreton	...	...	...	1	Pioneer River	...	(bar lights)	2
Inskip Point	...	...	...	1	Dent Island	...	...	1
Hook Point	...	...	...	1	Port Denison	...	...	3
Sandy Cape	...	...	...	1	Cape Bowling Green	...	...	1
Woody Islands	...	...	...	2	Cape Cleveland	...	...	1
Lady Elliott's Island	...	...	...	1	Hinchinbrook Bar	...	...	1
Burnett River	...	...	...	1	Port Douglas	...	...	1
Gatcombe Head	...	...	...	4	Low Island	...	...	1
Bustard Head	...	...	...	3	Point Archer	...	...	1
Auckland Point	...	...	...	1	Rocky Islet	...	...	1
Cape Capricorn	...	...	...	1	Grassy Hill, Endeavour River	...	...	1
Keppel Bay	...	...	...	1	Channel Rock	...	...	1
Sea Hill	...	...	...	1	Clermont Island	...	...	1
Bolmlara Island	...	...	...	1	Piper Island	...	...	1
Port Alma	...	...	...	1	Goode Island	...	...	1
North Reef	...	...	...	1	Proudfoot Shoal	...	...	1
Pine Islet	...	...	...	1	Norman Bar	...	...	1
Flat-top Island	...	...	...	1				

And, in addition to these coast lights, every bay and river has its particular system of guiding-lights, beacons, and buoys, to enable mariners to get to their several destinations at all hours and without mishap.

Too much cannot be said in praise of the care and skill displayed in rendering the navigation of our coasts and harbours safe and convenient; and this, too, at a cost which could only have had in view the future development of our trade, and the security of life and property in our vast waters. With efficient sailing instructions, the reefs, shoals, banks, and general impediments which render dangerous under other circumstances the traffic of these seas, any mariner can traverse the various passages without fear of wreck or other disaster, can find and easily navigate vessels into safe havens, when the winds and waves in the vast Pacific threaten them with destruction.

It may be here mentioned, that the large steamers of the British-India Steam Navigation Company have traversed the intricate and dangerous Torres Straits route for over four years without a single mishap; and when it is known that thirty ships of their line alone pass through that passage per annum, it will be readily understood that the sailing route has been carefully and thoroughly marked out.

CONCLUSION.

In concluding this paper, which, however, is too brief to do justice to the subject, I wish to make a few general remarks on the subject of our trade and prospects, which may not, perhaps, be unacceptable. I have said enough to prove that our resources are incalculable, and that their development has been so far satisfactory. We, the workers, have shown that they can be worked profitably, and foreign capitalists have come in with their means to do the rest. Our squattages in many cases, our mines, our financial institutions, every-

thing save our manufacturing industries, have been pressed forward from outside, and in nearly every case the investors have been satisfied. We have not lived long enough yet to have established a wealthy class amongst us, although we are very rapidly approaching that condition. The recent rise in the price of land will have operated in this direction, for many amongst us will have realized portions which, in their turn, will require investing. A distinct leisure class cannot be fairly said to exist in Australia. Our moneyed men are still workers and their sons are to be workers also. This condition has its effect upon the higher culture of the colonists, and prevents the spread of those refining influences which are so distinctly visible in older communities. We are an industrious people; we are working with an object, and time alone will develop the class which shall give a higher tone to our society, while it may, perhaps, deprive us of many of those qualities which, rightly used, induce solidity and wealth. We are buyers, sellers, and producers, at present, and are working to create a nation. We are doing our very best, according to our means, to provide a home for the "crowded out" of the British Empire, and a field for the industrious of the world. We have ample room for millions, and invite them. We want customers for our wares and produce; we want occupants for our unoccupied acres.

The field of commerce we have ploughed, and it is now ready to receive the germs of future greatness. Our commercial system is based upon fairly sound principles, and is supported by men of probity and experience; it has grown with our growth and, like our growth, is sturdy and healthy. With fairer seasons than we have lately experienced, there can be no doubt of our future progress; we have fought a sturdy fight with opposing influences and are still healthy and strong. There are evidences of continued prosperity daily brought to our notice in improved buildings, in expanding suburbs, in enlarged industries, in extended commercial relations, in a continued access of foreign capital, in a regular succession of mining developments, in improved literature, in educational expansion and more elevated thought. Our immigration scheme is liberal and comprehensive; it offers comfort and independence to all industrious and steady sons of toil who may feel inclined to make Queensland their home. The agriculturalist will find a yielding soil and cheap land; the mechanic will find work in one or other of the large workshops we have before indicated; the skilled workman will be appreciated; the man of thews and sinews will find them very marketable; the domestic servant will meet with ready employment in all cases, providing that honesty and sobriety be added to proficiency in their several callings.

THE MINERAL INDUSTRIES

OF

QUEENSLAND:

BY

K. T. STAIGER, F.L.S., ETC.

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THE MINERAL INDUSTRIES OF QUEENSLAND:

BY K. T. STAIGER, F.L.S., ETC.

COAL.

THE knowledge of the existence of coal in the colony dates back to the time of its first settlement, but it was not till 1849-50 that the first attempts to raise coal for commercial purposes were made on the Brisbane River, seven miles from Ipswich.

When the separation of Queensland from New South Wales took place, only the modest quantity of 12,000 tons were raised annually.

The following table gives the yearly output and value of coal since the year 1860 :—

	1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.	1868.
Quantity of Coals in Tons	12,327	14,212	24,067	24,000	25,000	33,000	39,316	17,988	19,611
Total Value £ ...	9,244	9,922	19,253	15,000	15,500	19,435	21,249	9,566	11,519
Value per Ton of Coal	15s.	14s.	16s.	12s. 6d.	12s. 5d.	11s. 9d.	10s. 9d.	10s. 8d.	11s. 9d.
	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.
Quantity of Coals in Tons	11,120	22,639	17,000	27,727	33,613	43,443	32,107	50,627	60,918
Total Value £ ...	5,907	12,311	9,407	16,120	22,052	19,700	14,835	26,470	25,659
Value per Ton of Coal	10s. 8d.	10s. 10d.	11s. 0 $\frac{3}{4}$ d.	11s. 7 $\frac{1}{2}$ d.	13s.	9s.	9s. 2 $\frac{1}{2}$ d.	10s. 5d.	8s. 6d.
	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885	...
Quantity of Coals in Tons	52,580	55,012	58,052	65,612	74,436	106,000	125,000	170,000	...
Total Value £ ...	21,272	22,759	24,573	29,033	33,592	48,500	62,000	75,287	...
Value per Ton {	8s. 1d.	8s. 3d.	8s. 5 $\frac{1}{2}$ d.	8s. 10d.	9s.	8s. 4d.	8s. 6d., 12s.	8s. 6d., 11s.	...

By this table it is seen that, although considerable fluctuations in the quantity of output of coal and a gradually diminished market value per ton of coal has taken place, the coal-mining industry is rapidly progressing and prospering.

All this coal, up to the year 1882, was raised in the coal-basin of the Bremer and Brisbane Rivers. It is only a few years since the Burrum coalfield yielded an output of coal of any consequence.

When, however, the immense extent of coal measures in Queensland and the innumerable outcrops of coal on the banks of rivers and creeks are considered, the resources of Queensland, as regards coal, can safely be said to be inexhaustible.

The coal measures of Queensland belong to two distinct geological periods.

Those coal measures which are situated to the north of the 26th parallel south latitude belong to the true palæozoic carboniferous formation, being accompanied by the same leading fossil plants such as lepidodendron, glossopteris, &c., as those found in the carboniferous formations of New South Wales, Europe, and America.

To this formation belongs the extensive coalfield which nearly fills the vast basin formed by the different tributaries of the Fitzroy River, stretching over 4 degrees of latitude.

This coalfield is rather distant from the sea and a good shipping port, and, although touched on several points by the Central Railway, none of the different seams are worked at the present time for more than local consumption.

The next most extensive coalfield is situated on the Bowen River, 60 miles inland of the town and seaport of Bowen, but until lately little notice was taken of it.

As the railway will in a short time connect this coalfield with its natural harbour, energetic steps have been taken for its development. Boreholes have been sunk at different places under the superintendence of the Government Geologist, and these have revealed the presence of many workable seams of coal of several feet in thickness.

This field has a great future by its being, in the first instance, not too far removed from a very good harbour and shipping port (Bowen, Port Denison), and, in the second instance, by being surrounded at its back by the extensive lead, silver, gold, and other mines of the Sellheim River, Cape River, Ravenswood, and Charters Towers.

Near Cooktown the northernmost outcrop of coal of the palæozoic age is met with, but up to the present time the mines have not been worked.

The time can, however, not be very far distant when this field will also contribute its quatum of coal to the market, as the distance from sea is very small and the facilities for shipping great.

Eighteen miles distant from Maryborough, in a northerly direction, is situated the highly important coalfield of the Burrum River. Its extent exceeds 100 square miles, and it possesses four or five workable seams of coal, from three to five feet in thickness, very free from intervening veins of shale.

The field is at present worked by two different companies, which turn out per week 600 tons of coal.

The coal, as regards hardness, quantity of ashes and sulphur, and heating power, is quite as good as the celebrated Newcastle coal of New South Wales, being also of the same geological age—(palæozoic).

For the last two years a railway has connected the field with Maryborough, the port and industrial centre of the Wide Bay District, and also with the important mining centre of Gympie.

These two townships and the surrounding districts consume nearly all the coal raised, and up to the present very little is exported, although coasting steamers take part of their supply at Maryborough.

The southern and south-eastern part of Queensland is also, to a great extent, a coalfield, but of a far more recent geological period, belonging to the mezozoic or carbonaceous formation. Its leading fossils are frequently identical with those of the Indian coalfields, indicating the same geological age.

The principal fossil-plants are *tæniopteris*, *pecopteris*, *sphenopteris*, &c.

The greatest development of this coalfield is to the east of the dividing range, and especially in the basins formed by the Bremer, Brisbane, Logan, and Albert Rivers, and also on the Darling Downs.

The upper strata of this field in the neighbourhood of Ipswich consists of sandstone resting on shales, intersected by thin bands of ironstone, some of which is sufficiently rich for smelting.

The decomposed shales furnish an excellent clay for pottery and bricks.

The coal from the lower beds which are worked near Ipswich makes a very good coke, fetching 21s. per ton, and is used principally in the foundries.

The upper beds, which are principally developed at Walloon and the Darling Downs, are of a more bituminous character, and are therefore well adapted for the manufacture of gas. One ton of coal produces about 40 gallons of petroleum oil.

During the year 1885 there were employed in the eleven coal mines round about Ipswich nearly 300 men below, and 84 men above ground, who turned out 147,500 tons of coal, to the value of £62,687 10s., at 8s. 6d. per ton.

At the same time the coalfields on the Burrum turned out 22,500 tons of coal, of the value of £12,600, or 11s. per ton.

LOCALITY.	Men Employed.		Tons of Coal turned out.	Value per Ton.	Value, 1885.
	Above ground.	Below ground.			
IPSWICH—				<i>s. d.</i>	<i>£ s. d.</i>
Aberdare Mine	25	105	50,000	8 6	
Bundanba Mine	15	60	40,000		
Ebbw Vale Mine	4	6	500		
Mount Pleasant and Banahead Mine	10	30	17,500		
Bræside Mine	8	25	10,000		
Rose Mine... ..	2	6	2,000		
Walloon Mine	4	10	5,000		
Eclipse Mine	5	18	12,000		
Waterstown Mine	5	15	4,000		
Walker's Mine	2	4	1,500		
Bore Hole Mine	4	12	5,000		
Total	84	291	147,500	...	62,687 10 0
BURRUM COALFIELD (WIDE BAY)—					
Torbanlea Mine	10	42	10,500	11 0	
Australian Land and Coal Company	12	50	12,000		
	22	92	22,500	...	12,375 0 0
Total	106	383	170,000	...	75,062 10 0

GOLD.

It was in the year 1858 that Queensland (which was at that time a dependency of New South Wales) became known to the world at large as a gold-producing country. In that year, rumours of immense gold deposits in the neighbourhood of Port Curtis reached Melbourne, attracting thousands to the new Eldorado only to return poorer, sadder, and wiser men. Some gold found at Canoona, on the Fitzroy River, about twenty miles distant from the present town of Rockhampton, gave rise to these exaggerated rumours. Some of the miners, however, remained and soon discovered other goldfields in the neighbourhood, which, as well as Canoona, are still worked. The now important chief town of Central Queensland, Rockhampton, owes its origin to the rush above-mentioned. For the next ten years Queensland made little progress as a gold-producing country, until in 1868, when the now celebrated Gympie Gold Field was discovered. Since that year

the production of gold increased considerably, and although fluctuations have taken place the production is steadily augmenting, and may soon rival that of Victoria, as shown by the following table :—

	1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.	1868.
Gold in ounces	4,127	1,077	190	8,000	22,037	25,339	22,916	48,213	165,801
Value in £ ...	14,576	3,928	625	30,000	83,292	92,938	85,561	170,000	593,516

	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.
Gold in ounces	138,221	136,733	171,937	186,019	194,895	375,586	391,515	374,776	353,266
Value in £ ...	523,041	489,139	616,907	660,396	717,540	1,356,071	1,498,433	1,284,165	1,307,084

	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	...
Gold in ounces	283,592	251,552	228,120	259,732	230,091	212,783	307,804	300,000	...
Value in £ ...	1,052,490	1,024,337	820,643	925,012	829,655	744,741	1,077,314	1,050,000	...

In 1885 the drought in Queensland was so severe that for some months many of the goldfields were at a complete standstill for want of water, and others could only be partially worked ; hence the total returns for 1885 show a small decline compared with those for 1884.

GOLDFIELDS OF SOUTHERN QUEENSLAND.

GYMPIE.

Amongst the goldfields of Southern Queensland, Gympie takes the foremost place. It is situated on the Upper Mary River, in the Wide Bay district, 114 miles to the north of Brisbane, and 60 miles south of Maryborough, its port, with which it is connected by rail.

This goldfield, discovered in the year 1868, has now become a town of over 7,000 inhabitants, of which 1,200 to 1,500 are employed as gold miners, earning on an average £250 each yearly.

The formation in which the gold is found is Devonian slate, intermixed with a thick bed of calcareous rock, which contains numerous impressions of *spirifera*, *orthis*, and other Devonian fossils. The beds in which the fossils occur, with a hard dark-blue rock, have the appearance of being of igneous origin. These calcareous strata are in many parts of the district regularly interstratified in thin beds with slate, thereby indicating that they are sedimentary deposits and not a green-stone trap rock, as originally supposed. That the calcareous rock in which the productive gold reefs of Gympie are worked is of a sedimentary character is highly important, as it shows that the auriferous reefs which traverse it continue of the same character to a considerable depth. Already mines of very great depth (1,000 feet) are worked profitably, proving that an immense area of gold-bearing

rock is still untouched. The gold at Gympie is frequently accompanied by pyrites, which are often highly auriferous, and are subjected to treatment for the further extraction of gold. Most of the gold is in its free state and alloyed with silver, and is therefore worth in Gympie only £3 10s. 1d. per ounce.

In 1884 there were on the field 52 steam-engines, of 883 h.p., supplying the moving power for the winding, pumping, etc., at the mines, and driving 6 crushing-mills with 147 heads of stamps. There were 163 companies connected with quartz mining in existence, with a nominal capital of £1,564,362; paid-up capital, £610,881, in 5,066,550 shares. In 1884 over £250,000 were paid as dividends.

The number of distinct quartz-reefs proved to be auriferous in Gympie and neighbourhood is 34.

The returns from the goldfield, including Kilkivan, Black Snake, etc., from their discovery till 31st December, 1885, are—

Up to the end of—				Oz.	} Value £3 10s. per ounce.
1877	...	...	..	625,000	
For the year—					
1878	...	...	...	41,654	
1879	...	...	...	38,453	
1880	...	...	...	43,072	
1881	...	...	...	67,861	
1882	...	...	...	50,312	
1883	...	...	...	64,818	
1884	...	...	...	112,051	
1885	...	...	...	86,832	
Total				1,130,053	£3,955,186

Not far distant from Gympie are several minor goldfields, such as Kilkivan, Black Snake, Imbil, and Jimna. But only a few claims are worked. The gold at Black Snake and Kilkivan is nearly all intimately associated with iron and copper-pyrites, intermixed with sulphide of lead (galena) and sulphide of zinc (black jack). This kind of gold-bearing ore is extremely difficult to treat with advantage, and this is the cause of the slow development of these fields, although such pyritical ore assays from 3 to 5 ounces of gold per ton on the average.

WARWICK.

In the neighbourhood of Warwick are several small goldfields such as Thane's Creek, Lucky Valley, Talgai, and Pikedale. The gold-bearing rock is also Devonian. On the Talgai Gold Field the gold is now and then found associated with tellur. Although these fields have been worked for a considerable length of time no important results were obtained.

MOUNT PERRY.

Near Tenningering (Mount Perry) are situated three different goldfields—Boolboonda, Molangool, and Normanby. There are four distinct auriferous quartz-reefs on these fields. They were worked in

1884 by 17 alluvial and 10 quartz miners. During 1884, 594 tons of quartz were raised and crushed, yielding 421 ozs. 13 dwts. of gold. The ounce of this gold is valued on the spot at £3 5s. The gold is more alloyed with silver than the Gympie gold.

GOLDFIELDS OF CENTRAL QUEENSLAND.

The goldfields of Central Queensland comprise the districts of Rockhampton, Port Curtis, Peak Downs (Clermont), and Nebo.

ROCKHAMPTON.

The Rockhampton district includes Canoona, Queensland's oldest goldfield. It is still in existence, but not much work is being done.

The only alluvial goldfield in the Rockhampton district, which is worked at present, is Rosewood, where nuggets weighing from 3 to 18 ounces of gold have been found during 1884. Several quartz-claims are also at work, but want of water prevents energetic working. The same remark holds good for the other goldfields in the district, such as Cawarral, Morinish, and Crocodile Creek, where very good stone is raised. In spite of the severe drought of 1884, and the still more serious one of 1885, there were raised from these goldfields, during 1884, 22,158 ounces, and during 1885, 19,569 ounces, and that exclusive of Mount Morgan.

MOUNT MORGAN.

This latter gold-mine is especially rich, but no returns can be obtained from the proprietors. The gold is quite pure, and exceedingly finely-divided in the stone. This, according to the report of the Government Geologist, Mr. Jack, is due to the fact that Mount Morgan was in former geological ages a hot spring—a sort of geyser, the water of which held gold in solution, and which was afterwards chemically precipitated and consolidated with the other mineral matter thrown up by the spring into a ferruginous stone. The spring has long since ceased to flow. Similar formation is found in the neighbourhood of Mount Morgan, but the efforts to find payable gold have not yet been successful.

On the Rockhampton Gold Fields are 11 steam-engines, with 157 h.p., supplying the power for winding, pumping, and driving 11 crushing-machines with 90 heads of stamps. The number of auriferous quartz-reefs was 98. The fields were worked by 30 alluvial and 410 quartz miners, all Europeans.

GLADSTONE.

In the Port Curtis district, of which Gladstone is the principal township, are situated the goldfields of Calliope, Cania, Norton, Boyne, and Kroombit. Want of water kept these fields greatly back. There are 36 quartz-reefs proved to be auriferous. These different

fields are worked by 71 alluvial and 53 quartz miners. The number of steam-engines which supply the necessary power for three crushing-mills of 18 heads of stamps, is three, of 18 h.p.

The return of gold for 1884 and 1885 is nearly the same—namely, 2,133 and 2,100 ounces, valued at £3 10s. per ounce.

PEAK DOWNS.

The goldfield of Clermont (Peak Downs) returned 3,268 ozs. of gold. During 1885 a great revival in gold mining matters took place on the field, and the area of the field itself was greatly enlarged towards the end of that year. There were in 1884 three steam-engines of 50 h.p. on the field, giving moving power to two crushing-mills, and for winding and pumping. 31 quartz-reefs proved to be auriferous, and on the field were 190 European and 107 Chinese miners.

NEBO.

The Nebo Gold Field gave in 1884 employment to 21 alluvial and 19 quartz miners (European). There was only one steam-engine, which drove one crushing-mill of 10 heads of stamps.

The returns from this field vary very much according to bad or favourable seasons. In 1883 the return was 2,095 ounces of gold; in 1884, only 500 ounces. As soon as the drought is broken the goldfield will experience a great revival.

GOLDFIELDS OF NORTHERN QUEENSLAND.

These greatly excel in richness and in their vast extent those of Central and Southern Queensland.

The formation in which gold-bearing veins occur is also different from that of the southern part of the colony. It is barren of fossils, and the rocks in the neighbourhood of the veins are granitic.

CHARTERS TOWERS.

The most important and most developed goldfield in the North is that of Charters Towers, situated 85 miles south-west from Townsville, its port, with which it is connected by rail. On the field live about 7,000 persons, of whom 1,200 are quartz-miners below ground, and 500 are working at the mines above ground.

On the field are 61 steam-engines, of 665 h.p., employed for pumping and winding; and 16 steam-engines supply the motive power for 14 crushing mills of 202 heads of stamps for reducing the ore. The aggregate value of the machinery on the field is £150,000.

There are 90 mining leases in force covering an area of over 1,000 acres, whereas the whole extent of auriferous alluvial and quartz ground worked upon is 500 square miles.

On these 500 square miles 458 distinct quartz-reefs have been proved to be auriferous.

Forty-one mining companies have been registered, with a nominal capital of £942,700 ; paid up capital, £489,170, in 1,042,000 shares.

Very great progress has been made with deep-sinking. One shaft had exceeded in 1884 the depth of 1,000 feet, and several now are 800 feet deep, and others from 400 to 600 feet deep.

The general width of the reefs varies from 6 inches to 12 feet, and on an average $1\frac{1}{2}$ to 2 feet.

The value of the ounce of gold on the field is £3 7s.

The yield of gold of the Charters Towers Gold Field, since its discovery up to 31st December, 1885, is—

Up to the end of—				Oz.	
1877	...	...	...	599,000	
For the year—					
1878	...	...	...	72,189	} Value, £3 7s. per oz.
1879	...	...	...	83,275	
1880	...	...	...	85,298	
1881	...	...	...	82,324	
1882	...	...	...	79,595	
1883	...	...	...	69,555	
1884	...	...	...	109,335	
1885	...	...	...	130,000	
Total				1,310,571	£4,390,412 17

RAVENSWOOD.

Fifty-two miles from Charters Towers is the Gold Field of Ravenswood. This field is also connected with Townsville, its port, by rail, and has a population of 1,200 Europeans and 300 Chinese, of whom 176 are European quartz miners, 115 Chinese, and 30 European alluvial diggers.

The gold occurs on this field partly in a free state, and partly intimately incorporated in very complex combinations of sulphides of iron, copper, lead, and zinc. These pyrites assay on an average of 3 to 4 oz. per ton. They are very difficult to treat for the remunerative extraction of gold. Even when smelted with galena, an ore plentifully found on the goldfield, a considerable percentage of the gold remains behind in the copper-containing slag, and has to be further extracted by treatment for metallic copper or to be thrown away. The shafts attain on this field no great vertical depth, the deepest being not quite 300 feet. The gold-bearing veins run more horizontally, and hence the shafts are driven on the underlie, and reach very often a distance of 400 feet.

On the field are 44 steam-engines, of 439 h.p., driving 10 crushing mills, with 83 heads of stamps, 23 winding gears, 26 pumping gears, 22 blast-furnaces. The total value of this machinery is £59,030.

There are 100 distinct quartz reefs proved to be auriferous.

The total yield of gold in ounces, since its discovery up to 31st December, 1885, is—

Up to the end of—				Oz.	Value, £3 8s. per oz.
1877	...	...	...	201,400	
For the year—					
1878	...	...	...	13,252	
1879	...	...	...	15,744	
1880	...	...	...	13,445	
1881	...	...	...	10,195	
1882	...	...	...	8,711	
1883	...	...	...	13,000	
1884	...	...	...	14,192	
1885	...	...	...	17,641	
Total				307,580	£1,045,772

ETHERIDGE.

About 250 miles to the west of Townsville, and 200 miles east of Normanton, in the centre of the base of the Cape York Peninsula, is situated the extensive goldfield of the Etheridge, comprising also the goldfield of Gilberton.

The centre of the Etheridge Gold Field is Georgetown. The population consists of 512 Europeans, 444 Chinese; total, 956. The average earning of a miner per year is £156, the usual rate of wages of a miner being £4 per week. There are 12 steam-engines of 135 h.p. on the field, which supply the motive-power for 10 crushing mills, winding, and pumping gear, &c. The number of claims worked is 135, and there are 150 distinct quartz reefs proved to be auriferous, covering an area of 2,000 square miles.

The gold occurs on the field in quartz veins frequently allied with mundic (pyrites). These latter assay on an average 4 ounces of gold. The gold is not as difficult to extract as it is from the Ravenswood pyrites.

The great distance of this field from the coast, and consequently the very defective communication therewith, retards the development of its very rich gold reefs. The value of the ounce of reef gold is £2 18s., and of alluvial gold, £3.

GILBERTON.

The Gilberton Gold Field, one of the most promising but least developed fields, was last year showing more activity, and several claims were taken up to be worked by southern capitalists. This field is not only promising in gold, but also in lead, silver, bismuth, tin, copper, and gems. The great want of rain last year stopped nearly all work on this field, as well as on all the others in the district.

WOOLGAR.

The Woolgar Gold Field is situated to the south-west of Gilberton. It is one of the latest discovered, and possesses at present a population of 145 Europeans and 116 Chinese; total, 261. The average

earnings of a miner per year is, on this field, £100. This goldfield possesses 45 distinct gold reefs, proved to be auriferous, and covers an area of 250 square miles. There are on the field 5 engines of 40 h.p., supplying the necessary motive power to 3 crushing mills, pumping and winding gear. This goldfield has also to contend with very incomplete and very dear communication with the seaboard, a defect which will in a short time be greatly reduced by the opening of the railway to Hughenden, from which town it is distant 110 miles.

The total yield of gold in ounces of the Etheridge and Woolgar Gold Fields since their discovery is as follows:—

Up to the end of—				Oz.	
1877	...	...	...	143,000	
For the year—					
1878	...	...	...	7,396	} Value, £2 18s. per oz.
1879	...	...	...	15,498	
1880	...	...	...	20,368	
1881	...	...	...	23,020	
1882	...	...	...	18,431	
1883	...	...	...	18,967	
1884	...	...	...	19,886	
1885	...	...	...	24,000	}
Total				290,566	
					£842,641

In 1885 the drought was so serious that mining was for two or three months totally stopped, or otherwise more gold than 24,000 oz. would have been obtained.

HODGKINSON.

The Hodgkinson Gold Field, situated about 70 miles inland from Cairns, is remarkable for the irregularity of its geological formation. Sandstones, slates, and igneous rocks are jumbled together in a heterogenous manner, often capped by stratified sandstone. Thornborough is the centre of the goldfield, which has a population of 789, of whom 131 European and 43 Chinese are miners. There are 46 quartz reefs proved to be auriferous, and 46 is also the number of reefs worked. On the field are 15 steam-engines of 177 h.p., which drive 10 crushing mills with 101 head of stamps, also 5 pumping and winding-gears. The total yield of gold is—

Up to the end of—				Oz.	
1877	...	...	...	59,516	
For the year—					
1878	...	...	...	44,435	} Value on the field, £3 12s. per oz.
1879	...	...	...	33,675	
1880	...	...	...	25,096	
1881	...	...	...	15,308	
1882	...	...	...	12,495	
1883	...	...	...	7,505	
1884	...	...	...	7,245	
Total				205,275	£738,990

THE PALMER RIVER.

This is the most extensive alluvial goldfield in the colony. It is distant from Cooktown 120 miles in a direct line, and will be connected during next year with that port by rail. When this takes place the goldfield will make a fresh start. The carriage from port to this widely-spread field is very high. There have been 145 quartz reefs proved to be auriferous, but still the gold obtained by reefing amounts only to one-eighth of the total yield of the field, seven-eighths being alluvial, mostly obtained by Chinese. Of the latter there are 700 on the field, and only 66 Europeans.

There are 9 steam-engines, driving 5 crushing-mills of 50 heads of stamps, winding and pumping gear.

The gold of the Palmer River is of great purity, and the value is £3 17s. per oz. on the field.

The total yield of the field is—

Up to the end of—					Ozs.
1877	...	...	...	...	839,000
For the year—					
1878	...	...	...	...	120,233
1879	...	...	...	...	90,000
1880	...	...	...	...	65,433
1881	...	...	...	...	51,960
1882	...	...	...	...	37,339
1883	...	...	...	...	24,089
1884	...	...	...	...	15,637
Total					1,243,691
					£4,788,210

COPPER.

This metal occurs frequently in its metallic state in various copper mines of Queensland, but most frequently in the Cloncurry copper mines, where one solid mass of virgin copper, weighing half-a-ton, was found some years ago.

The copper is, however, principally met with in combination with sulphur as copper pyrites. It occurs also in great masses as oxide and carbonate without sulphides at the Cloncurry; in almost every other copper mine the oxide of copper is, however, derived from the oxidation of the sulphide.

In many places, such as Mount Coora and Mount Clara, near Kilkivan in the Wide Bay District, copper ores occur associated with gold, silver, and lead, and were formerly reduced only to "Pimple Copper," which contained gold and silver, and as such was shipped for further treatment.

MOUNT PERRY.

In the Burnett District, in the neighbourhood of Mount Perry, many valuable copper mines are found. Of these the Mount Perry mine is the most important. Here the shafts reach a depth of nearly

1,000 feet. This mine, after a hard struggle and notwithstanding the most skilful and economic management, had to be given up on account of the extremely low price of copper. All the other mines in the neighbourhood, like the Normanby, Wolca, Boolboonda, Edina, &c., had to be relinquished for the same reason.

PEAK DOWNS.

In Central Queensland the Peak Downs mines were very celebrated for their richness in copper ore.

The Peak Downs district is about 250 miles distant from Rockhampton, the nearest principal shipping port, and is now connected with that port by rail. The expenses for carriage were in former times very great.

So rich and plentiful, however, was the ore of the Peak Downs mine at one time, that large dividends were paid for five years, in spite of expensive carriage, dear management, and wages at £4 a week. The price of copper was, however, at the same time very high. Now, however, everything is at a standstill; the low price of copper and the quality of the ore precluding further operations.

CLONCURRY.

By far the most important copper deposits, rivalling, if not surpassing in extent and richness, the celebrated Lake Superior mines in North America, are met with on the Cloncurry River and its neighbourhood, near the Gulf of Carpentaria.

The "Great Australian Copper Lode" is now being properly worked by an English company, which has over 200 men at work in raising ore, erecting machinery and buildings, burning charcoal, sinking wells, etc. The ore contains on an average over 50 per cent. of metallic copper. It consists at present mostly of oxides and carbonates, intermixed now and then with virgin copper. A similar lode, and, according to latest news, still more extensive than the Great Australian Copper Lode, is the "Argylla Mine," which, it is asserted, pays handsomely at £1 per ton of ore on the spot. The ore assays also very high (50 per cent). Besides these two prominent lodes there are many other very conspicuous and rich copper lodes, within the radius of 100 miles of the Cloncurry in a westerly and north-westerly direction.

A railway to a seaport on the Gulf is absolutely necessary to work these mines to advantage. The distance from the sea is a little more than 200 miles, and the usual road is often impracticable. Only mines of such great extent, and producing ores of such high percentage, are able to be remuneratively worked in the face of the present extremely low price of the copper.

EXPORT OF COPPER DURING THE LAST 25 YEARS.

	1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.	1868.
Copper and copper ore, in tons	1	49	268	1,100	2,000	721	3,168	6,140	9,033
Value in £ ...	50	1,450	10,332	30,000	60,000	58,440	91,872	84,200	73,020
	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.
Copper and copper ore, in tons	6,310	1,335	2,490	2,448	2,441	2,228	1,674	2,105	1,959
Value in £ ...	76,230	80,795	174,300	196,000	185,808	164,040	121,950	147,000	167,337
	1878.	1879.	1880.	1881.	1882.	1883.	1884.		
Copper and copper ore, in tons	574	567	326	331	1,724	1,653	2		
Value in £ ...	35,126	34,791	20,137	19,637	14,982	30,872	17		

Total export of copper in its metallic state and as copper ore :—50,646 tons; value, £1,878,416.

TIN.

It was in 1872 when the first discovery of alluvial or stream tin was made close to the boundary of Queensland and New South Wales, at a place called Quart Pot Creek, one of the small indirect feeders of the Darling River. Very soon after which a township sprung up which received the significant name of "Stanthorpe."

Tin was first discovered in the drift of rivers and creeks; not in its metallic state, but as oxide of tin. As such it has a dark colour, and escaped for a long time the notice of the diggers.

This description of tin ore is called "stream" or alluvial tin. "Lode" tin is the oxide of tin found in the matrix, from which by disintegration the stream tin is derived.

For some time after its discovery, stream tin was procured in large quantities and at a trifling expense. This combined with the high price obtained on the spot, £70 and £80 and upwards per ton, enabled men without capital to earn large sums of money and in some cases laid the foundation of a fortune.

Soon, however, capital made its appearance, and powerful companies erected expensive machinery and the alluvial diggers migrated to the North, where the rich alluvial diggings of the Palmer River Gold Field afforded them opportunities of more rapidly acquiring wealth. Thus another Stanthorpe was discovered in the North, now known as Herberton, at present the most important tinfield in Queensland.

For the five or six years following its discovery the trade of Stanthorpe was very important, but the alluvial claims began to be

worked out, or nearly so, and the price of metallic tin fell too low to be remunerative. The production of tin ore at Stanthorpe, which is purely alluvial or stream tin, is now only in the hands of a few. No remunerative lodes of tin ore have yet been discovered in the neighbourhood, although small veins are frequently met with; these, however, are too small and too far apart to be of any commercial value. In 1884 there were only 36 miners employed on the field, producing 934 tons of stream tin, of the value of £41,096.

The Herberton Tin Field, situated on the Wild River, is, in a straight line, 32 miles distant from the sea, but a very steep and high chain of mountains necessitates a very circuitous road, making the distance nearly double.

This chain of mountains is a great drawback to the rapid development not only of the Herberton District but also of the large extent of mineral country stretching from the western slope of the range across the base of the Cape York Peninsula, terminating with the Etheridge and Croydon Gold Fields. When the railway—which will connect Herberton with its port, Cairns—is finished, the present state of things will be materially altered.

In the Herberton district, which came into notice in the year 1880, the tin is found in reefs as well as in the alluvial deposits. The latter are of less importance than the tin-producing reefs.

During 1884, 450 tons of stream tin, of the value of £16,200, were produced by 120 European alluvial miners, against 1,900 tons of lode tin, of the value of £68,474, which were produced by 380 reef miners.

The lode tin was obtained from 130 tin miners; and 11,000 tons of tin-bearing stone were raised, producing 1,900 tons of black tin, or 17·2 per cent. The tin-bearing reefs have been proved stanniferous to a depth exceeding 200 feet. The geological formation is granite and chloritic slate. There are two steam engines of 97 h.p. on the field, driving six crushing-mills with 65 heads of stamps, as well as machinery for concentrating and purifying the ore. The value of tin ore is £36 per ton on the field (1884).

One or two tin-smelting furnaces were erected during the last two years, converting much of the ore into metallic tin, giving employment to several, and effecting a considerable saving in expenses for carriage.

Alluvial tin is also found in the Ravenswood district, at Running Creek and Kangaroo Hills. Here the dry weather interfered, and nothing important was done during the last year.

On the Palmer River there is also a small deposit of stream tin, which gives employment to about 14 miners, who raised, notwithstanding a very unfavourable season, 70 tons of stream tin, of the value of £3,556.

The quantity of tin exported as ingot tin and tin ore, to the end of 1884, is:—

	1872.	1873.	1874.	1875.	1876.	1877.	1878.
Ingot tin and tin ore, in tons	1,407	8,938	5,702	4,475	4,315	3,335	2,849
Value in £ ... £	109,816	606,184	358,550	237,879	187,201	133,432	88,366

	1879.	1880.	1881.	1882.	1883.	1884.	
Ingot tin and tin ore, in tons	2,877	2,847	3,456	4,261	3,500	3,383	
Value in £ ... £	120,391	142,977	193,699	269,904	154,000	130,460	

Total export of ingot tin and tin ore during 13 years:—51,545 tons of the value of £2,732,769.

SILVER AND LEAD.

These two metals are usually found intimately combined as silver-bearing galena. It is therefore scarcely possible to speak of them separately.

Queensland possesses proper silver ores of the richest description, and in large quantities; for instance, the native chloride of silver (hornsilver) at Silverfield, contains 75 per cent. of silver, or something like 24,000 oz. the ton of ore, as well as freibergite or silver fahlerz, containing 15 per cent. of metallic silver, besides zinc and copper without lead, although the vein of this rich silver ore is running through a lode of galena and blackjack.

The principal form in which silver is obtained is galena, and it is found in several places in well-developed workable lodes of sufficient richness in silver to make mining payable.

The Ravenswood Gold Field, including the Star and Sellheim River Fields, is celebrated not only for its richness in gold-bearing pyrites, but also for the many valuable and extensive deposits of silver-bearing galena.

In Ravenswood proper four mines are worked for galena. Amongst these the most prominent is the Ravenswood Silver Mining Company. The value of machinery on the mine is £15,000, and the depth to which the shaft is sunk is between 700 and 800 feet. The mine adjoining has also shafts over 700 feet deep, and at this depth has struck the above-mentioned vein of rich fahlerz, carrying 15 per cent. of silver. The other two mines did not turn out much ore during 1884 and 1885, although it is as good in quality.

The Sellheim River Field has many and well-developed lodes of silver-bearing galena.

Excepting in one or two mines, very little work beyond prospecting was done during last year. A great drawback to the development of this field is its distance (64 miles) from railway (with the additional difficulty of having a broad river to cross); or from Bowen, the shipping port (112 miles). The railway, which is proposed to be built from Bowen to the Bowen River Coalfield, will benefit this field considerably, by shortening the distance, and the subsequent development of the coalfield will afford an opportunity of reducing the galena to lead bullion, thus saving greatly in freight and producing an easily saleable article.

During the last few months the Star River Field, eighty miles north of Ravenswood, shows signs of revival, and several claims have been taken up.

Large smelting works for proper treatment of galena and pyrites have been lately erected at Ravenswood; but it was only towards the end of 1885 that they were in proper working order, and are now turning out lead and bullion in quantity. The works buy the ores at a fixed price for the ounce of silver or gold contained in the ore. This new start in mining industry, and its success, is causing some of the large mine proprietors to think about erecting furnaces and other necessary works for smelting the galena from their own and other mines. This cannot fail to give a great impetus to the development of mining for galena and silver, and will induce many to work properties which, for want of easy disposal of the ore, have hitherto been neglected.

The Herberton Silver Field is celebrated for its rich finds in pure horn-silver, of which several large parcels were sent to England for treatment during last year, besides which several mines are worked for silver-bearing galena. The latter is generally very rich in silver, containing over 100 ounces to the ton. An attempt was also made on the field to smelt the silver-bearing galena into lead bullion, thus saving a part of the freight and producing a marketable article. There is a great future for this field, and returns are likely to be very large during this year, and they will be still larger when the railway from Cairns to Herberton is finished.

During 1884 there were on the Herberton Silver Field twenty miners employed in the galena mines, and 200 tons of ore were sent from there to England.

ANTIMONY.

This metal, in its combination with sulphur, is found in quantities in three places in Queensland, at two of which, viz., that in the Burnett district, and the other at Northcote, near Thornborough, the operations have ceased, in consequence of the low price of antimony which has ruled during the last few years, the distance from a shipping port, and the difficulty of transport.

The Neardie antimony mine, close to railway, and situated between Gympie and Maryborough (its port), was worked for a considerable time, and produced the bulk of the antimony exported. It proved to be a very valuable and extensive mine. The low price realised for the antimony was the reason for its being for a time relinquished; but recently attempts have been made to resume operations.

The total yield of antimony ore during the last ten years has been 2,462 tons, value £24,556.

MANGANESE.

The most important ore of manganese is pyrolusite or manganoperoxide. This ore is frequently met with in Queensland in small quantities, except at Gladstone, where a large deposit was discovered more than twenty years ago, and which has been worked from time to time and trial shipments frequently made. One great advantage this large deposit has over other ores is, that its situation is immediately on the shore of one of the best natural harbours in Queensland; the ore can therefore be obtained in quantity with a minimum of expense for carriage. Total export for the last twenty years, 500 tons; value, £2,300.

IRON.

Ores of iron are found plentifully all over the colony. The principal ores are:—Clay-iron ore, carbonate of iron, hæmatite, and magnetic iron ore. The clay iron ore and the carbonate of iron are principally met with in the neighbourhood of the coal mines of Southern Queensland. None of the ores, up to the present time, are in any demand.

CHROME-IRON.

Chrome-iron ore is found in considerable quantity fifteen miles from Ipswich, close to the Brisbane River. Nothing as yet has been done to develop this valuable deposit. (See chrome exhibits.)

COBALT ORE.

A rich deposit of cobalt ore has recently been discovered in the neighbourhood of Kilkivan. The ore is strongly interlaced with serpentinitic rock, and consists of the oxides of cobalt, iron, manganese, and copper, and in some parts of the ore a small quantity of nickel is found. The quantity of oxide of cobalt in the ore varies from 5 to 12 per cent. No sulphurets or arsenurets are present, thus greatly facilitating the extraction of the cobalt.

QUICKSILVER.

Quicksilver, in its combination with sulphur as cinnabar, is only found in anything like remunerative quantities at Kilkivan, a place abounding in serpentinitic rock. Formerly the cinnabar was sent to England with a good deal of matrix still attached to it. Lately,

however, it has been converted into metallic quicksilver on the spot, and as such has found a ready market. The total exportation of impure cinnabar from 1874-1878 was 13,000 lbs., value £3,000.

BISMUTH.

This metal is not infrequently found mixed with stream tin, mostly in the state of oxide, as bismuthite. A somewhat larger quantity of bismuthite was found at Cloncurry, but seems to have run out, as for some time there has been none in the market. At Cloncurry nuggets of metallic bismuth, encased in oxide, were obtained, weighing several ounces, and also small nuggets and grains of gold imbedded in oxide of bismuth, to the extent even of 33 per cent., the remainder consisting of oxide of bismuth. A larger quantity of bismuth ore is reported to exist in the neighbourhood of the Percy River, but no tangible proof of its existence has yet come to hand.

MOLYBDÆNUM

Is casually found at Stanthorpe, Ipswich, and other places. A larger deposit has recently been discovered thirty miles west of Mackay. It seems that quantities of $\frac{1}{2}$ cwt. to 1 cwt. can be obtained, but at what expense is at present unknown.

WOLFRAM

Is found in veins (either in its pure state or allied with tin ore), at Stanthorpe and its neighbourhood, and also at Herberton. At the latter place it seems to occur in considerable quantities, but up to the present time there has been no demand for it.

PLUMBAGO.

The principal deposit of this mineral exists at Mount Bopple, Tiaro, on the Mary River. It is found in different states of purity. Several trial shipments were made, but the prices obtained were not encouraging; hence a local company was formed with the object of manufacturing articles in which plumbago forms the principal constituent, and also for the purpose of refining it and producing an article of readier sale than the crude mineral.

MARBLE AND LIMESTONE.

Large deposits of crystalline limestone are found in the Devonian formation. The principal places are near Warwick, Gladstone, Rockhampton, and the small islands lying off the coast between Rockhampton and Mackay. The whitest marble, and one well adapted for sculpture and other ornamental work where white colour is a desideratum, is found thirty miles from Warwick. Marble of various colours is found on the Calliope River, Gladstone district; white and black marble on the islands off the coast. The white marble from the latter possesses, however, a yellowish tint. Marble of inferior colour,

or of no distinctive colour, is generally used as limestone, and is made into excellent quicklime. For the latter purpose coral from off the coast is frequently used.

ORNAMENTAL BUILDING-STONE, BRICK-CLAYS, &c.

To the west of Kilkivan a deposit of eklogite exists. This fine and beautifully-coloured ornamental stone has not yet come into use, chiefly on account of its inaccessibility. Granites have not yet been utilised for ornamental or building purposes, although some very prettily coloured varieties are met with. The building stones generally used in Brisbane and other parts of the colony are sandstones, mostly of a white or brown colour. In Brisbane itself a porphyry is frequently used. This is derived from a large boss which traverses Brisbane and its suburbs on both sides of the river.

On the coalfield of the Brisbane and Bremer Rivers very large deposits of siliceous clay are found. This clay lies over and under the coal measures. It is used for making superior bricks for building, &c.

GEMS.

Queensland has not yet produced any precious stones worth special mention, with the exception of opals. The area in which opals are met with is large, but only in one or two localities are opals of any value obtained. The opals of Queensland are remarkable for their brilliancy and variety of colour, rivalling in that respect those of Hungary. They are found of considerable size, and are of great value. A large proportion are, however, of inferior colour, and therefore of little value.

Of other gems there have been found diamonds, rubies, sapphires, topazes, &c., in the tin-bearing drift of Stanthorpe. Agates are found in large quantities in the Agate Creek, Etheridge Gold Field. There they can be procured in all colours and sizes by the hundredweight.

SODA.

Large tracts of land in the interior are frequently covered with a white powder during dry weather. This, when roughly collected, consists of 25 per cent. of carbonate and bi-carbonate of soda, 6 per cent. carbonate of calcium, 10 per cent. of common salt, and 59 per cent. of clay, sand, &c. The railway will soon pass close by one of these fields, and it might offer inducement for manufacturing washing and caustic soda, &c.

MINERAL SPRINGS.

There are many mineral springs, both hot and cold, existing in Queensland. But two only are much known; one, situated on the railway line between Brisbane to Toowoomba, near Helidon, taking its name from the latter place as "Helidon Spa Water." The temperature of the spring is 73 deg. F., and its specific gravity 1.0076.

The gallon contains 291·42 grains of solid substance, which is composed of—

Bicarbonate Soda	...	...	...	221·36 grains.
„ Potash	...	...	...	2·34 „
„ Lithium	...	...	...	1·81 „
„ Calcium	...	...	...	10·65 „
„ Magnesium	...	...	...	1·82 „
„ Rubidium	...	...	...	(traces in the spectroscope).
Chloride of Sodium	...	...	...	45·08 grains.
Silica	...	...	...	2·13 „
Alumina and Iron	...	...	...	3·23 „

291·42 grains.

This water is highly charged with carbonic acid and largely used all over the colony not only for medicinal purposes but as a refreshing mineral water, either by itself or with other beverages.

Other boiling springs of considerable extent exist in the Etheridge district, the water of which is said to possess remarkable medicinal properties.

Near Woodleigh, in the Herberton district, in the bed of a creek, is a hot spring, nearly of the temperature of boiling water. It contains lithium, but no sample properly taken has been analysed.

Woodleigh, being situated 3,000 feet above the level of the sea, possesses a fine and healthy climate, and many people use the water with considerable effect, as a cure for rheumatic complaints. Other hot springs are situated in the interior of Central Queensland, but nothing definite is known of them.

TABLE OF EXPORTS.

The total exports of the mineral products of Queensland, with their values, up to 31st December, 1885, are as follow:—

—					Tons.	Ounces.	Value.
Coal	...	...	...	...	1,215,407	...	£600,165
Gold	...	...	...	...	...	4,694,322	17,051,404
Copper	...	...	...	...	50,646	...	1,878,416
Tin	...	...	...	...	51,545	...	2,732,769
Antimony	...	...	...	...	2,462	...	24,556
Manganese	...	...	...	...	500	...	2,300
Quicksilver ore	...	...	...	...	5	...	3,000
Galena and silver, estimated	...	...	...	...	...	...	200,000
Total Value	...	...	...	...	...	...	£22,492,610

AGRICULTURE IN QUEENSLAND :

BY

PRICE FLETCHER.

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AGRICULTURE IN QUEENSLAND:

BY PRICE FLETCHER.

A FAVOURABLE climate being requisite for successful farming, it will be as well to open this essay upon Agriculture as carried out in this colony, by stating the characteristics of the Queensland climate. Afterwards the essay will treat of the soils and their qualities, the crops commonly given, and the modes of farming usually adopted in the different districts.

Agriculturally speaking, Queensland can be divided into temperate, semi-tropical, and tropical zones.

SEASONS.

The temperate zones comprise the high lands of the interior mountain ranges of the southern part of the colony. Here for the greater part of the year the weather is fine and the air bracing and enjoyable. In the winter an occasional fall of snow occurs, but it never accumulates on the ground, and thus necessitating the housing of stock and the cessation of field operations. Indeed this snow generally melts as soon as it touches the ground. Still the winter months are bitingly cold to anyone who has been resident in the colony for a few years; albeit new comers do not think so. The coldest months are May, June, and July; these comprise the winter time. The three summer months are December, January, and February, during which time the weather is decidedly hot—too much so, in fact, for out-door work to be carried on in comfort. Nevertheless it is carried on, and no ill effects ensue, provided steady habits are kept. The rainy season occurs during these summer months and continues on to April; this is the time of the year the farmer looks for the growth of all crops of a semi-tropical character. The rains then fall very heavily, but are not of such a continuous nature as to cause many days' work to be lost. The dry time of the year is the winter and early spring, when, notwithstanding the sun's heat being moderated, the grasses become quite brown and dry, native vegetation shows no growth, and the ground becomes so parched that at places—more particularly on black soils—it cracks into fissures sometimes one foot to two or more feet deep. It will be at this season of the year that irrigation will eventually be universally adopted, thus rendering it an absolute certainty for the farmer to obtain a constant growth all through the year. The above remarks apply generally to the whole of the colony, excepting that it is only on the southern inland or downs country that snow ever falls.

The rainfall of the agricultural portions of the inland country averages from 20 inches to 50 inches during the year. On the coast lands—that is, about Brisbane and also on the lands to the eastward of the great dividing range of mountains that extends from north to south of the whole of Australia—more rain falls on an average than to the westward of this range; seldom less than 50 inches is recorded during the year, except in a few not so favoured spots, such as Rockhampton and the Burdekin. Notwithstanding this rain, the winter is generally dry and parching, but the extreme cold of the westerly winds is not so keenly felt. When the tropical line is reached—that is, from Mackay northwards—the winter weather, instead of lasting for three months, continues only for one month or less. Further to the north still—that is, in the vicinity of Cairns, the Johnstone River, and of Cooktown—frosts and cold winds are unknown. The rainfall here reaches the enormous quantities of 150 inches in the year, and here it is that farming assumes the form of true tropical agriculture and horticulture. Sugar-cane is king, and the growth of anything in the soil is unchecked either by cold or want of moisture. Cultivation is indeed easy, for the land is amazingly fertile, and a hothouse climate reigns.

SOILS.

The soils of Queensland vary much as do those of other extensive countries. The chief peculiarity is the absence of chalk and limestone lands suitable for cultivation. In this respect they differ from much of the land in the southern part of Australia. Taking them in detail, it is as well first to write of the

SCRUB OR JUNGLE.

The best soils for the cultivator are undoubtedly the alluvial flats which fringe the rivers, and which in a state of nature are covered with an impenetrable jungle of trees and undergrowth, called in colonial language “scrubs”; and when scrub soil or scrub land is mentioned it means land which at one time had been thus covered. All such lands are eagerly coveted by settlers, and except in the north of the colony it would be difficult for the immigrant to find any that are now unalienated. But as much of it has been taken in large areas by capitalists whose only idea is to sell again, there is always an opportunity of buying at a fair rate. The fertility of these lands is amazing. Often the rich soil is many feet in depth when formed by soil washed down from volcanic hills at the head of the rivers, and deposited on the flat lands lower down; this soil, in itself fertile, is supplemented by the constant dropping of leaves and the decay of the tropical herbage of the scrub. This sort of land is a mine of wealth to any man who gets it for his farm, and has capital to work it. Even without capital to commence with, many of our most successful farmers—more especially Germans—owe their success to the enormous productiveness of these scrub soils. They are especially suited for maize, sugar-cane, sweet potatoes, English potatoes, lucerne, &c.; indeed, anything and every-

thing grows well in them, and with the minimum of cultivation bestowed yields the maximum of results. This is fully treated of in the essay on horticulture to be found at the conclusion of this paper.

FOREST.

The forests of Queensland are of enormous extent, and the greater part of them grow upon inferior soil. But there are lightly timbered lands, the soils of which, being of volcanic origin, are deep and fertile to a wonderful degree, and produce their own peculiar crops year after year without as yet any apparent decrease of yield. Some of these soils are quite black in colour, others a dark chocolate, and others various shades of red. These soils are always fertile, and are eminently suited for cereals, lucerne, maize, or grasses. They have been largely taken by farmers, but there are millions of acres of similar soil yet belonging to the Crown. A forest-covered soil of a lighter colour, with yellow-clay subsoil, is also extensively distributed. This sort is not profitable for culture, but as grazing ground it is fairly suitable. The same remark applies in a less degree to sandy soils, of which there are large areas especially on the coast; indeed, these cannot even be said to be good grazing land unless the stock are at the same time supplied with other food. Still, situation and proximity to market often give advantages which counteract any deficiency in the original richness of quality, and much of this sandy land is selected by farmers. On it there often grows good timber suitable for the saw-mills, so that the crop actually growing on the land when chosen is frequently a handsome return in itself.

THE INLAND PLAINS.

Far inland to the westward the extensive plains or downs occupied by pastoral tenants of the Crown (usually termed squatters) are, generally speaking, of two descriptions of soil. One of these is a clay, more or less dark in colour, and which at some distant date was under the sea, and on which the herbage is grandly luxuriant and fattening to the animals grazing upon it. No cultivation has as yet been attempted on this description of land. There is no doubt as to the fertility of the soil itself, if the climate was only propitious, having been originally to a great extent an ocean bed, as shown by the flakes of gypsum lying on the surface. This clay is the mud deposit of ages ago; marine shells abound in it; and having now for centuries been exposed to the hot sun of this climate, it has been sweetened and fertilised, and has, and does, grow great crops of grass to a height up to 3 or 4 feet. These yearly decay, and are mingled with the ground, or are burned, and the ashes returned to it; thus they now form vast prairies of thousands of square miles in extent—veritable boundless seas of grass to the eye of the beholder. Irrigation will yet be brought to bear upon suitable portions of these fertile plains.

Intermingling with these prairies are large belts of inferior soil, upon which grows nothing but an almost useless grass called "spinifex," under an upper growth of low scrubby trees called "gidyea"—members

of the acacia family, and generally useless for economic purposes. For further information as to the use made of these pastoral interior lands, the reader is referred to the essay on "Pastoral Pursuits."

TABLE-LANDS.

There is yet another class of soil which, though more limited in area than any of the others, has been found so wonderfully fertile, wherever it does exist, that it deserves notice. This is the soil of the table-lands. On the top of many of our mountains—varying in height from 400 to 3,000 feet—there is often found a deep soil of a red or chocolate colour. Sometimes this is covered by a dense jungle, which intensifies by its decaying organic matter the great richness of these soils. The climate on these heights being cooler, fruits and crops common to European countries can be grown with great success. Lucky is the farmer who can secure a piece of one of these table-lands and find a practical dray-road up to it. Toowoomba, 100 miles west of Brisbane, is an example of an important town having sprung up on a similar description of country; it is about 2,000 feet above the sea. Herberton, in the Tropical North, 4,000 feet above the sea, is also the centre of an extensive series of table-lands, many of which are of great fertility, surrounded by country which is of extreme richness in minerals of all descriptions.

ROMA SAND.

Some 300 miles west of Brisbane is the town of Roma. The town is the centre of a level pastoral district. There is there a sandy loam of a distinct character from any of the soils before mentioned, and which of late years has been proved to be unsurpassed in the colony for the growth of the vine; wheat and other cereals also grow well in a good season. This fact, only discovered of late years, opens up a large area upon which the cultivator can with safety settle with profit, for there are hundreds of square miles of similar description still in the hands of the Crown.

SILURIAN HILLS.

These are perhaps the poorest class of soil to be found in the coast country. There are large areas of them, all of which are densely covered with fine forest trees, often of sufficient size to be available for the saw-mill, and with an undergrowth of she-oaks, tea-tree, acacias, etc. The grazing capabilities of such hills are very poor. The immigrant who lands at Brisbane will see a sample of these soils on the hills the town is built upon; it is a thin skin of loam resting on a poor gravel, with in many cases the silurian rock near the surface. Yet experience proves that this land, when trenched and manured, grows all kinds of fruit and ornamental trees in great luxuriance, so that the suburban resident has no difficulty in surrounding his villa with a beautiful garden. The flats or gullies in the neighbourhood, being formed of the washings-down of the surface-soil from the hills, are fertile enough, and are chosen by the Chinese for market-gardening purposes.

SANDY SEA-SHORE.

There are stretches of sandy soil fringing the extensive sea-shore of the colony. These apparently are utterly barren, but cocoanuts and pineapples have been tried on them and found to succeed admirably within the tropics. For cocoanuts no other trouble is required than the actual planting. There are now several plantations started of from 500 to 600 trees. The high tide-waters may come close up to the trees, and yet they grow luxuriantly. These soils also are found to grow the luscious mango to great perfection.

SUGAR-CANE.

Sugar-cane growing and the manufacture of sugar, being the most important of the methods adopted by our agriculturists of wresting wealth from the soil, has been allotted, in this hand-book, a special essay dealing thoroughly with the present state of this very productive industry, therefore it is needless to refer to it here.

ARABLE FARMING.

THE DARLING DOWNS.

The chief centre of this system of agriculture is the Darling Downs District. The soil there is of volcanic origin, and varies in colour from black to chocolate and red. It is generally of a clayey nature on the plains, yet such a clay that it crumbles down with the action of the sun after rain in a similar manner that the soils of Europe crumble after frost. All soils that thus crumble by the sun are fertile. This knowledge is a good foundation for the immigrant to judge the quality of his newly acquired farm. In Queensland, wheat, oats, barley, and rye are winter-grown crops; that is, they require the coolest time of the year for their development. They are sown in April, May, and June, and the harvest is reaped in September, October, and November, according to the character of the season. The cultivation required is of the easiest; one or two comparatively shallow ploughings being all the preparation necessary to produce a crop of from twenty to forty bushels of wheat during a favourable season. The great drawback to young wheat in the colony is the prevalence of the "rust" fungus. But for this terrible scourge wheat-growing would be an easy and profitable system of farming. No specific remedy has yet been discovered to combat this plague. It is most destructive in the very seasons that are most favourable for a heavy crop. In a dry year it is not so prevalent. Experiments are constantly being tried with various varieties of wheat from India, China, America, and elsewhere, with the view of discovering a sort that is rust-proof. So far these experiments have only been partially successful, and until some really efficient remedy in kind, or in cultivation, or in the application of a destroying agent, is discovered, it is hardly likely that wheat-farming will progress very rapidly.

It is the custom in these colonies to make hay of oaten and wheaten crops, cutting them just when the ear is filled, but before the straw loses its green colour. The hay thus made is excellent and

commands a regular and increasing market at remunerative prices. Meadow hay, as grown in Britain, is unknown in Queensland, although a coarse hay is sometimes made from native grasses. A good hay is, however, made from lucerne. The common fodder of the horses in the towns consists of chaff made from equal parts of lucerne and oaten or wheaten hay. The grain commonly used as horse-food is maize. The oat is one of the most useful crops on these downs farms; it is a winter crop if grown for grain, but for fodder it can be sown early in autumn and again in the spring. Barley is chiefly sown for fodder for dairy cows, for which purpose it is both a winter and summer crop. Rye is also grown, more particularly by German colonists, for fodder for cattle.

All those engaged in cereal-farming possess also more or less cattle, which graze on the uncultivated land attached to the farm, or upon other selections—as farms are called—chosen by their owners, perhaps in other districts. Frequently there are commons, and large areas of waste lands belonging to the Crown, upon which the farm cattle run.

Lucerne is by experience found to be the green crop most suitable to the colony. A deep rich soil is always chosen for it, and it thrives admirably upon these Downs' wheat lands. It is a constant grower if only it can get moisture; in winter and summer it then retains its green colour, and its rapidity of growth is marvellous.

English grasses do not thrive so well in this colony as in the more southern ones. Clover, rye-grass, cocksfoot, &c., are but seldom seen. Their place in cultivation is occupied by the American grasses, such as prairie, Johnson, and Guinea grasses. These all thrive well and produce heavy crops of hay or green fodder. For grazing purposes the American buffalo-grass and the indigenous couch-grass are commonly grown; they both produce a dense sward of good feed, liked by all stock.

Roots are regular crops on the Downs. Turnips, mangolds, and potatoes, in fair seasons, produce very heavy yields, with only one-half the labour bestowed upon them in Europe. Peas and vetches take a less prominent part in the agriculture of Queensland than they do in the other colonies where the choice of crops is not so great.

It will thus be seen that with the mild climate which enables stock to be exposed in the open air all through the winter, as long as they have a shelter-shed to go under when so inclined—with the fertility of a maiden soil and the great variety of crops that suit the climate—the farmer has no need to carry all his eggs in one basket, but can combine grazing, dairying, and cereal-farming with advantage. The area of land suitable for the above purpose and not yet alienated, or if alienated not yet under the plough, is immense. It embraces hundreds of square miles.

SCRUB-LAND FARMING.

Farming, as carried out by settlers upon the scrub lands of the river banks of the coast or of the Northern seaboard, differs from that of the inland system in that wheat is never grown; and the other

cereals are only grown for the purpose of green feed or hay. The crop that takes the place of wheat is maize, or "corn," as it is universally called. This plant grows with great rapidity, and yields enormous crops for a minimum of labour bestowed. The rich deep vegetable soils of these one time scrub-covered lands suit this plant in every way. In newly cleared land all that is required to get a full crop is to scratch a hole with the hoe and drop in the seed. Nothing else is done until the harvest of from 40 to 80 bushels per acre is gathered. Until within the last few years maize has been grown in excess of requirements, but the progress of the colony has lately been so rapid that prices are now at a paying figure and likely to continue so. It is the chief grain-food of all the horses in the towns, and if fed to pigs enables the farmer to make the best of pork. Two crops can be grown during the one year—that is, in the Northern coast districts. As green fodder it is at the head of the list of the multitude of plants that can be grown in this climate; for this purpose it can be sown at almost any season of the year.

When the immigrant chooses a piece of scrub land, the first job after putting up a tent or rough hut is to take a sharp axe and fell all the trees and jungle; this is then allowed to lie as it falls for three to six months' time, according to the weather; then a fire is lighted on a windy day and a complete sweep of everything but the large logs and stumps is made. The stumps of scrub-trees soon decay, and in a few years' time they will all have disappeared. The great quantity of vegetable matter burned leaves a deposit of ashes from 2 inches to 4 inches thick; these contain much potash, and serve a good purpose in stimulating the crop. Maize is always the first crop sown, except in the sugar districts, where cane is often substituted. Anything will grow on these scrub soils—roots, vegetables, grasses, corn, or fruit-trees.

The sweet potato is the second grand stand-by of the coast-land farmer; indeed, it is so of all farmers, for this exceedingly prolific crop is at home on all classes of soil. It is, without doubt, the most useful of all plants cultivated in the colony. It is food for man, animal, and fowl. Horses greedily eat the tubers, and can work as well when fed with them as they do when fed with corn. Cows in their eagerness to get this favourite food will run after the man carrying it; and they produce excellent milk and butter when fed with these roots. Pigs also fatten readily upon them, and fowls thrive well. On the selector's table these tubers are a daily dish, either boiled, roasted, or baked under meat. The tops are as good fodder as the roots, also the leaves when boiled for the table are as tender and good as spinach. The crop matures in five or six months, and in the North two crops a year are gathered off the same land. The yield is from 8 tons to 20 tons of roots per acre, and as much of vines or tops.

The many varieties of millet and sorghum are all grown by the coast-land farmer for fodder or seed. They grow quite as readily as maize, are yielders of enormous quantities of fodder, and they take only three to four months to mature.

SPECIAL CROPS.

ARROWROOT.

This is another standard product with farmers on the Southern rivers of the colony. It grows very readily on any scrub soils, and also upon arable lands, if these are ploughed and tilled. The manufacture of it into farina is generally done by the grower, who may also supplement his own crop by purchasing roots grown by others. The mill and machinery required are very simple and non-expensive, but an essential to the production of a first-class farina is that there be an abundance of pure water.

TOBACCO.

This plant will grow in any part of the colony. It requires considerable manual labour to attend to it properly, as regards picking and curing the leaves, so the growing it as a farm crop is chiefly confined to the German settlers, who have families of children from whom they can draw the labour as wanted. This crop requires perhaps more care and attention than any other grown in Queensland. There is plenty of sale for the leaf, and there is room for any possible development of the industry.

COTTON.

This used at one time to be the staple product of the Ipswich district. It grows very easily and produces abundantly, but the great amount of labour required in picking the bolls by hand every day caused it to be an unprofitable crop as soon as the protective bonus granted by the Government to start the industry was withdrawn. The growth of it is now confined to a few German farmers who have families that can undertake the regular picking of the staple.

RICE.

Another special product, which experiment has proved to grow easily and prolifically from north to south of the coast districts, is the rice plant; yet so far it has not become a regularly grown crop. Near Cooktown and in the extreme North, one or two farmers, however, do grow it for commercial sale, and a very good sample is produced. The varieties most suitable are those to which irrigation is not essential, but even they will not succeed unless the season be a dropping one. The grain matures in about three to five months. Rice is essentially a summer and autumn growing crop.

COFFEE.

It has long been proved that the climate and soils of Queensland are well adapted to the growth of coffee. There are shrubs in the Botanic Gardens at Brisbane that have in due season borne berries regularly for about twenty years. On the scrub-soil hills this shrub grows without any special care other than weeding. Its growth has not, however, yet assumed any importance. A few farmers grow it, but only as an adjunct to other main crops; there is infinite room for

its extension as a paying industry. Probably this will not occur till population gets more numerous, and until another generation of farmers spring up who will not be so wedded to old-time notions and old-fashioned crops.

AGRICULTURAL INDUSTRIES.

APIARIES.

Great interest has of late been taken in bee-keeping by many. This is owing to the dissemination of knowledge through the Press of the improved and scientific methods of management. The introduction of Italian bees was attempted many years ago, but it was not until 1880 that, through importations effected by J. Fullwood, of Brisbane, this improved strain of bees was firmly established. Now the "Italians" are spread all over the colony, and even the many wild swarms common in the forests are getting hybridised with this foreign blood. There are several farmers who devote themselves exclusively to bee-keeping, and these establishments are conducted upon the most improved and methodical system as carried out in California. The enormous area of land covered by our eucalyptus forests contains untold quantities of honey now going to waste for want of bees to collect it. Indeed, it is a bee-harvest always in bloom—a feeding ground ever available to the bee—for all through the winter there are flowering gum-trees to be found. In this mild climate the bee never allows itself a rest even for a day, and the apiarist is relieved from the trouble and risk of "wintering" his hives. The local market for honey will soon be supplied, but even then honey is an article of food which is exportable anywhere, and bee-keepers here would be in as good a position as the Californian apiarist to make a profit out of such an interesting occupation.

SILK.

Silkworm-keeping and the production of silk is yet an industry waiting for the future to develop it in this colony. Several attempts have been made to establish it, but, so far, all have ended in financial disaster. The mulberry-tree grows as easily as a weed. The climate has been proved all that could be desired, and the quality of the silk produced was equal to the best. The "grain" has been successfully sent to Italy from Australia, and that even before fast steamers, fitted with refrigerating machinery, were common as they now are.

STOCK-FARMING.

The system of stock-farming upon the extensive natural pasture lands of this colony, termed "squatting," is fully described in the essay specially devoted to that subject.

HORSES.

On the farms or selections stock-raising is one of the chief items of profit. Most farmers keep a few good draught mares, and as no money has been spared by our capitalist land-owners to introduce into

the colony stallions of a high class, principally of the Clydesdale breed, the farmer has the choice of the best sires to which to send his mares. The consequence is that the class of draught horses found upon the farms is very good indeed. This is proved by the always numerous entries for the draught classes in the horse sections of the many agricultural shows now established in every district of the colony.

The breeding of blood horses is not generally undertaken by the farmers. This valuable branch of stock-farming is carried on chiefly by the capitalist land-owners, who are always free-handed in giving any price for animals of undoubted character. There are several establishments devoted especially to breeding racing stock, for horse-racing has taken as firm a root in Queensland as it has done in the other Australian colonies. It is the holiday amusement of the people, and whether in the country town or the chief cities the race-day is the event of the year. Consequently the interest in blood stock and the demand for capable horses is very great, and is increasing year by year. There is room for great development in this branch of stock-farming, as also there is for establishments devoted to breeding first-class hacks, horses for military purposes in India, and for carriage horses. We are a community where every individual can ride, and does ride when the chance can be got; therefore there is also a constant sale for even low-priced animals, with or without pedigree.

Mules are almost unknown in the colony, no one as yet having entered into the occupation of breeding them.

CATTLE AND DAIRYING.

The keeping and breeding of cattle for dairying purposes is a most profitable undertaking, notwithstanding that almost every farmer or selector does a little in the matter. In this paper the term "selector," as distinguished from "farmer," means a settler who has only comparatively lately acquired, or "selected," his land, and has not yet had time to have turned it into a civilised farm. Such a one is generally more anxious to increase his herd than to have dairy produce, therefore every calf is saved, the general practice being to rear the calf on the cow, by letting the two be together during the daytime but separated at night. The male calf is as valuable as the female, for the demand for bullocks for hauling purposes is constant. The local butchers also are always willing to buy from the selectors any bullocks that are fat. The rapid increase of population going on in our chief towns renders milk-dairying a paying pursuit, and one that will be always expanding. The demand for fresh butter is far in excess of the supply, and the price is always high. One reason for this is that the climate is too hot for successful butter-making unless the best appliances are used, and cold water or ice at hand. There are some dairies properly conducted where first-class butter is regularly made all through the hot summer, thus showing that it only wants management and it can be done. In the winter time beautiful butter can be made without trouble, provided only that good feed is given to the cows; the natural grasses being then at their worst are deficient in

nutriment, and require supplementing with other food. The great range of hay crops, fodder plants, and roots, which the dairyman has at his command for winter feed, gives to this colony great advantages in the way of possible production of dairy produce. As it is, our dairymen have hardly got into the habit of growing fodder, especially for their cattle, during the winter time, for hitherto there has been so much waste land about, where cattle could graze at will, that it has induced a slovenly system of cattle-keeping to become the custom. The past season of drought has taught many of these careless cow-keepers a lesson, for, there not being any grass on the waste lands, the deaths among these uncared-for cattle have been very numerous. There are, however, many good exceptions to this careless style of doing things, for our first-class dairymen are as careful to provide food for their stock as for themselves.

Cheesemaking has only in one locality developed into anything like a factory business. During a good season a considerable amount of cheese is made by individual farmers, and there is no reason why a very extensive industry in cheese should not become established, particularly now the Government are dividing the squatting runs into grazing farms of 5,000 acres to 20,000 acres each, and leasing these for thirty years at a low rent.

The system of preserving fodder in siloes has not yet come into practice here, but much has been written about it in the agricultural newspapers, so that our farmers are quite conversant with all the details of the new process. When the system is inaugurated it can be thoroughly carried out, for in no country under the sun can such a range of products suitable for silage be so rapidly grown.

PIG-FARMING.

When the great area of the colony is considered, together with the suitability of the soil to grow roots, sugar-cane, maize, cereals, lucerne, grasses, vegetables, and fruits, then it wants no prophet to foretell that eventually the number of pigs that will be bred in Queensland will be millions. Also the great development of the cheese trade that is sure to follow the subdivision of runs will also lead to a great increase in pig-keeping. As yet the number of pigs in the colony is but small. Of late considerable attention has been given by a few breeders to the importation of pedigree animals, and to working up pure herds. The improved Berkshire is taking quite a standing as a favourite, and the nondescript animals, common a few years ago, are past being improved out of sight. In this hot climate there is a very general opinion that the excessive fattening breeds, such as the China, are not so suitable as are the longer Berkshire.

SHEEP ON FARMS.

These have not yet taken the position in the system of farming pursued that they have done in Victoria. That they will do so is certain, for so much of the arable land is suitable for lucerne-growing and for other fodder plants and grasses on which sheep thrive, that it is only a matter of time when every farmer will have his flock. For

the purpose of farm-grazing the heavy, long, and coarse woolled breeds have been proved most suitable, and the favourite breed is the Lincoln. On good feed this sheep grows to a great weight, cuts a heavy fleece of wool, and matures quickly. Some farmers have adopted a system of buying and fattening sheep on lucerne, and forwarding by railway to the metropolitan market. Also, upon the large grazing farms, farmers' flocks of sheep will soon become a speciality. There is a good opening in this pleasant system of farming for many young farmers of the old country who possess a few hundred pounds of capital to commence with. On the coast sheep do not thrive on the natural pastures, and so none are kept. As these coarse grasses are converted into paddocks of lucerne, prairie, or buffalo grasses, &c., the combination of sheep-keeping with arable farming, even on the coast farms, will become a recognised feature of Queensland agriculture.

AGRICULTURAL SHOWS.

The custom of holding annual agricultural shows is wide-spread over the colony. There is hardly a town of importance which has not established an agricultural or pastoral society, which gathers together once during the year the best of the stock and produce of the district for competitive honours. These shows, equally with the races, are regarded as of sufficient importance to warrant a general holiday in the district they are held in, and so the attendance at them is always large. They have done much to induce the great attention to breeding, now almost universal among our stockowners. Each show has its speciality. Thus at Toowoomba the main feature is the sheep section, and there are annually collected on that occasion animals whose individual worth could be valued at hundreds of pounds. Indeed, in the show yards of the Royal Society there the exhibit of sheep could not, as a whole, be surpassed the world over. At Ipswich, horses are the special feature; at Warwick and Allora, wheat; at Beenleigh and Rosewood, farm produce; at Stanthorpe, fruit; at Mackay, sugar; at the important mining towns of Gympie and Charters Towers the annual show embraces all matters relating to mining as well as agricultural produce and stock. The towns of Maryborough, Rockhampton, and Townsville all make a special holiday of the agricultural show. In Brisbane the grand exhibition of the National Association, held every August, draws the best of all the specialities from the country shows, besides its own attractions in blood and draught horses, cattle of all breeds, sheep, pigs, dogs, poultry, and industries.

MARKETS.

In the matter of sale for his produce, the farmer still has the advantage of a home market. The supply of grain, hay, dairy and garden produce, and fruits is not yet equal to the demand. Of all these articles, enormous quantities are still imported, as a glance at the statistics of the colony will show. With a colony increasing in population so rapidly as Queensland is doing, this demand keeps ahead of supply, and it will be many years yet before

growers will have to look abroad for customers for their produce. When they have to do so then they will find that the difference in climate between semi-tropical and tropical Queensland, and the Southern Colonies and New Zealand, is so great that the large towns of Sydney, Melbourne, Adelaide, and Auckland will always be open to receive our products, for our warmer climate allows the maturing of farm and garden produce prior to what it can be done further south. Also the range of commercial products suitable for the world's markets, that can be grown in Queensland, is so great that the farmer need never fear being for long in the dilemma of not having buyers for the returns from his farm.

MARKET-GARDENING.

This is a branch of agriculture, hitherto much neglected, which offers great scope to the skilled gardener. The reason of this neglect is chiefly that without irrigation there is no certainty of growing good vegetables during the winter and spring months. Somehow this branch of gardening has been allotted to the Chinamen, who always locate their gardens near a creek, and water most assiduously with the watering-can. Even in the dry interior country the Chinaman gets good vegetables by the aid of constant watering. As a rule, their vegetables are not equal to those grown by skilful European gardeners.

IRRIGATION.

It has lately been forced upon the attention of our farmers, other than those whose farms are situated in the extreme rainy zones, that a system of irrigation must be adopted if the most is to be made out of the land. The climate of Queensland, so far as recorded observations go, appears to run in cycles from years of extreme wet to years of drought. During the ten years of good rainfall the growth of everything is prodigious, but latterly it has been found that such favourable seasons are followed by some years of deficient rainfall, when for many months in the year, more particularly the winter and spring time, no rain whatever falls, and the prevailing winds being dry, vegetation takes rest and a drought prevails. Queensland is not alone in this peculiarity, for all the Australian colonies on the mainland are more or less subject to these dry periods. Hence it is that a great deal of attention has lately been given to the subject of irrigation; for it is found that, given the fertile soil and the hot sun, then the flooding with water is the magic touch which transforms the bare field into a luxuriant fodder crop. Indeed, the results of what little experimental irrigation has been done are simply astounding, and they open up possibilities in the way of production that seem marvellous. The sugar-cane growers upon the Burdekin delta lands, finding that the climate of that district has a rainfall below what is required for the profitable growth of cane, have been forced into adopting irrigation, and the result is that four tons of sugar per acre can now be got where only one ton could be obtained from the same field not watered.

There are now about 800 acres of cane irrigated in that district alone. The experiments in the other colonies in the matter of irrigating wheat-fields have resulted in crops of 20 to 40 bushels, while alongside, the non-watered fields only produced 7 to 15 bushels. It will thus be patent that the prudent farmer, if he intends devoting his energies to arable farming, will choose a location near to available water if possible. These remarks apply more particularly to the settlers in the interior, for the necessity for irrigating the crops growing upon the coast fringe is not great, and in the tropical zones of the Cairns and Johnstone River districts the rainfall is so constant and so great that artificial application of water is never required.

WINDMILLS of the modern American type are now to be seen erected in all directions, on both farm and garden, and for watering stock. They are generally erected over wells; experience every day tending to prove that water can be got almost anywhere by due sinking for it. Californian and chain pumps are used by the Chinese gardener to raise water from the creeks for market-garden purposes. The pulsometer pump is the favourite with the colonial gardener, but upon the sugar plantations, or the wheat and lucerne fields, the quantity of water required to do any good is so great that centrifugal pumps turned by steam-power have to be used. In the Burdekin district alone there are no less than twelve such irrigating plants now at work.

IMPLEMENTS.

Labour being scarce and expensive, renders the adoption of machinery imperative whenever practicable. The most improved reaping and binding machines are to be seen on every cereal farm; and only ploughs of best modern construction find favour with our ploughmen, who pride themselves upon this skill just as much as do the ploughmen of the British Isles. Of Fowler's powerful steam-plough there are fully a dozen at work in the colony, tearing up the deep good soil to a depth of 20 inches, preparatory to being planted with sugar-cane or sown with lucerne. The best of harrows, hoes, and hand-tools are always used. None but the finest made American axes find favour with our woodmen. The drays and waggons are specially made to suit the colony's requirements, but are equal in quality and construction to any that can be manufactured in Europe. Portable steam-engines or else horse-powers are upon every farm, and are used for chaff-cutting, grinding, wood-sawing, pressing, &c. Flour-mills are erected in those localities where wheat-growing is carried on, and these are fitted with the latest improved milling inventions, and turn out a sample of flour unsurpassed in the world's market.

ADVANTAGES OF, AND DRAWBACKS TO, FARMING IN QUEENSLAND.

As in other countries, so is it in Queensland, that the cultivator has advantages and drawbacks peculiar to the climate. Already it has been mentioned that droughts prevail during some years for months

at a time ; but as a set-off to this drawback may be placed the fact that there is no cold winter during which stock have to be housed ; nor are our fields all covered for months with a coating of snow, while "king frost" reigns supreme. With very little expense and trouble could the farmer here store up fodder enough to carry his stock through a period of drought. It is simply thoughtless improvidence, induced by the genial climate, that has brought about the prevailing system upon our stock farms of not laying up provision for a dry time ; this carelessness is the chief cause of the enormous losses recorded through the just-ended time of drought. To the wheat-farmer of the colony the chief drawback is the disease called "rust." But for this, the deep fertile soils of our downs would produce, for a score or more of years to come, returns of 30 to 40 bushels of wheat per acre without requiring to be manured. So much attention is now being paid to this subject of rust, that it is only a fair inference to conclude that before many years a remedy will be discovered for this drawback. Floods come at times and destroy certain tender crops, such as potatoes, upon low-lying land—but as a set-off they leave a deposit of fertilising mud which induces a corresponding increase of crop the next season. Fires of crops and grass are a source of anxiety to the farmer and grazier ; but they chiefly arise through carelessness. As cultivation increases and stock gets confined in smaller fields this danger diminishes rapidly, for by keeping the pastures bare on the outside of the farm the fires are checked in their career. The fruit and vegetable grower has many difficulties to contend with just as he has everywhere. Fruit-eating bats destroy large quantities of fruit ; small animals root up the vegetables or crops, and injurious insects superabound. There are various methods of combating these drawbacks which the prudent man adopts. Dams, wells, and waterholes are now being made upon farms in all directions ; and localities which only a few years ago were thought to be useless for farm purposes are now settled upon and due supplies of water easily obtained. Hailstorms occasionally fall during the spring months and do much damage over the area of their effect ; fortunately they are extremely local, seldom travelling more than a few miles and not extending any great width on either side of their path.

Notwithstanding these drawbacks the farmer here has a happy time. The climate, though hot in the summer months, yet is genial and pleasant as a general rule. The winter is one long season of delightful weather, just sufficiently cold to make work pleasant and a fire at night to be appreciated. No snow covers the ground or interferes with the work ; the loss of time through wet days is very little. Around the house a garden can be made filled with fruit trees, which are a luxury only for the rich in the old country. Every farmer can have his pines, bananas, grapes, peaches, &c., without having to erect expensive glass-houses. Flowers of rare beauty can surround the porch, and edible passion-fruit can be grown as climbers over the verandahs. The horse costs but little to feed, for there is always so much spare pasture land upon which he can graze. The consequence is that

everyone in the country districts rides; not only the master of the farm, but every boy and girl of the family are sure to each possess his or her own horse. Life and property are everywhere secure; there is no "boycotting" or "rack-renting," or ejection. There is no poverty in the land other than of individuals whose own carelessness induces it. Everyone is well dressed, but the geniality of the climate is such that but little clothing is required. There are free schools for the children in almost every locality, and they get a good elementary education in them. Every man over twenty-one years of age has a vote in electing the Parliamentary member for the district; and no coercion is ever attempted to make him vote other than as his conscience tells him. In truth, every man is indeed a free man to do what he likes, and go where he likes, so long as he commits no breach of the laws, which laws are made by representatives of the people's own choosing, and not by any hereditary class.

THE
SUGAR INDUSTRY OF QUEENSLAND:

BY
PRICE FLETCHER.

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THE SUGAR INDUSTRY OF QUEENSLAND:

By PRICE FLETCHER.

HISTORY.

It was in the year 1823, when Sir Thomas Brisbane was Governor of New South Wales, that Mr. Thomas Scott demonstrated sugar-cane could be grown, and sugar manufactured, in Australia. In the year 1827 he had succeeded in making no less than seventy tons of sugar. This was at Port Macquarie, in New South Wales. So to this gentleman may fairly be given the honour of being the pioneer of an industry which has developed into one of the greatest importance.

Notwithstanding the unremitting advocacy of Mr. Scott, both in private and in the public press, no results followed his efforts until twenty years had elapsed. Then about the years 1847 to 1850 there was a fresh interest awakened in the subject, and cane was grown on the Brisbane River and Moreton Bay lands. To Mr. Buhôt is due the credit of having manufactured the first sugar, the produce of Queensland-grown canes. This was in 1862, and the canes were grown in the Botanic Gardens, Brisbane, of which at that time Walter Hill was director. But to Captain Louis Hope is conceded the honour of placing the sugar industry of Queensland on a commercial basis. By the close of the year 1862 he had twenty acres of his plantation, situated upon the shores of Moreton Bay, under sugar-cane. During 1863 and 1864 the industry took a decided spurt; much interest was excited in it; the Acclimatization Society came to its aid and imported many cuttings of different varieties of canes, and settlers upon small farms were all anxious to try the new venture. Greater facilities for obtaining land were just about that time granted by the Legislative Assembly, and in April, 1864, sugar companies were formed for the first time at Brisbane, at Maryborough, and at Mackay. At this last-mentioned town, which has since developed into the sugar-capital of the colony, Mr. Spiller was the first to plant cane, and Mr. J. Ewen Davidson was the first to erect a mill.

The industry now spread rapidly. The farmers on the Albert, Logan, and Coomera Rivers in the south, and the Mary River, north of Brisbane, all entered into it with zest. By the end of 1869, the progress had been so great that there were twenty-eight mills at work crushing the cane from 1,230 acres out of 5,000 acres under cultivation.

For the next seven years the industry thrived, the settlers began to understand the best methods of growing and manufacture, and large sums of money were invested in it. But now it was to receive a check

of quite an unexpected nature. A disease spread through the fields of cane and completely destroyed them. Locally it was named "rust," though investigations showed it to be different from the fungoid growth called rust that affects the wheat plant. At this time the varieties of cane grown were thick and succulent, and took two years to mature. Observations showed that thinner sorts, of a harder nature and maturing in the one season, were not troubled by this disease. Planters took the hint, met their troubles with great energy, speedily uprooted all the rust-stricken varieties and substituted the others, not, however, before a financial panic had spread among the capitalists who had money in the occupation, and consequently foreclosures upon the hard-working pioneers were numerous, and in many cases unwarranted. At this time the output of sugar made in the colony was about 15,000 tons. But the planters would not be extinguished. Those who still had their plantations economised in every way, and eventually proved that, with the annual varieties of cane, the industry could be carried on as lucratively as ever. Much credit is due to Mr. H. McCready, manager of the Te Kowai Plantation, Mackay, as regards reinstating the faith of capitalists in the ultimate profitable nature of the investment. This gentleman, for five consecutive years, demonstrated that sugar-cane could be grown and manufactured into marketable sugar at a cost of not over £10 per ton.

In 1879 and 1880 the desire to enter into the pursuit developed almost into a mania; land was everywhere selected with a view to cane-growing; capitalists vied with one another in their eagerness to start plantations, and every river, creek, or inlet flowing into the sea was explored, and, if suitable, immediately selected. Companies with gigantic capital were organised to buy up small-sized holdings upon which to erect stupendous mills. In one instance Parliamentary sanction was even granted to the sale of land by the selector-farmers to the wealthy company, long before the conditions had been fulfilled which, under the land laws, allowed of the legal transfer of the selection. Money, indeed, flowed freely for any purpose connected with sugar. The best of machinery was ordered from European foundries and erected in the colonies, often at ruinously high rates of wages; for so great was the desire to clear land and quickly get it under cane, that workmen simply put their own price upon their labour and got it. Managers upon the estates must have a certain area under cane to satisfy directors in the town; so they cared not what they paid so long as they could get the work done. Steam ploughs, with their powerful double engines, were daily at work in the fields; miles of private railway were laid down on the estates; extensive wharves were erected both by public authorities and by private capitalists, no matter what engineering difficulties were in the way; and thousands of acres were cleared of their native forest growth, ploughed, and then planted with cane. The demand for coloured labour became so great that the New Hebrides Islands, from which hitherto the islanders had always been drawn, could not supply it, and fresh recruiting grounds

were visited, which led to some questionable means being adopted at times by recruiting agents. At this time the large area of delta-land at the mouth of the Burdekin River was the scene of unwonted activity and life in undergoing this development into plantations; the Herbert River lands, further north still, had for years been proved to be admirably suited for the sugar-cane, and now every acre of the district had been selected, and establishments, vieing with those of Mackay, were at work where only small mills had been previously sufficient. More land was wanted. Private exploring parties searched every bay and inlet still further north, and soon plantations were formed at Cairns, and on the Johnstone and the Mossman Rivers, and even on the McIvor River to the north of Cooktown. Mackay had developed into a thriving, bustling town, with a shipping trade which thronged the river; the wharves were crowded with heavy and expensive machinery, and the stores filled with sugar. Townsville was rapidly overtaking Brisbane in importance, for it was the shipping port for the Burdekin delta estates to the south of it, and the Herbert River plantations to the north. Cairns began to grow into notice, and the extensive area of dense jungle land on the Johnstone River promised the uprising of a large sugar-supported town.

The Government statistics at this time—1883-4—now showed 157 mills to be at work, crushing the cane from 27,792 acres, and producing 34,148 tons of sugar, and 144,073 gallons of rum. Also there were 43,367 acres actually under sugar-cane cultivation, and 1,071,413 gallons of molasses had been the by-product of the industry.

Just at this time—1883—when this great height of development had been reached, there was no sign of the black cloud of depression that for the second time was about to envelop the young industry. Certainly two dry seasons in succession had caused a diminution of the crops, but that was only regarded as a disappointment of expectations—which was the true way of looking at it—and not as a misfortune. However, it helped to stop incoming returns to a considerable degree. Then there began to be discovered the fact that this rapid extension of estates was not an unmixed evil, for it increased the demand for kanaka labour to such an extent that the Islands could not supply it. The recruiting schooners took months to fill up their numbers, and this meant extra expense, and so the price for passage money was increased from the low figure of £12 per head, which was common in the early days, to £25, and even £30. Moreover, the physique of the islanders now brought was not equal to those that came previously, so that two labourers had to be counted as equal to one. The mortality upon the plantations was also very great. Thus the working expenses were greatly increased, and these expenses were still further proportionately increased by the very high wages paid to the very large number of white hands employed at the skilled work.

At this juncture of affairs a few of the pioneer planters sold out their interests, thus realizing large fortunes, and leaving inexperienced men to combat the impending troubles. Unexpectedly the price of sugar began to fall. Rumours reached the planters that there was a

system of export bounty in force among European nations upon sugar manufactured from beetroot, which had so stimulated its production that the world's markets were being swamped by it. Hitherto planters had considered it quite safe to calculate upon netting £20 per ton of sugar at Queensland ports. Now prices were actually down to £15 for very best qualities, while seconds and thirds were unsaleable. In the early days of the industry £30 and £35 per ton was easily obtained, now only one-half that was the value. Eagerly was information sought as to the probability of this excessive production being permanent, and it was with considerable satisfaction that planters found, when they boldly looked their trouble in the face, that there was at least equal chance of cane-sugar being grown and manufactured for as low a figure as could beet-sugar in Europe. Also they learned that in quality their cane-sugar was superior to its rival; that, according to scientific chemists, more juice could be got out of the cane than was actually being done; that it was quite possible to grow more cane per acre, and to economise in many ways the working expenses of the estates. X But while all this trouble regarding the fall in value was pressing so hard, there was unfortunately an increasing popular feeling all over the colony against the employment of kanaka labour. It had long been foreseen by the planters that the supply of Pacific Islanders would be inadequate to meet the demand as the industry expanded, and their wish therefore was to obtain coolie labourers from India under due Governmental regulations. This was, however, negatived by the vote of the Legislative Assembly, but the employment of kanakas was still permitted. At the present time—1886—the Parliamentary fiat has gone forth that after 1890 the recruiting of South Sea Island labourers must cease.

Thus it is that, at the present moment, this extensive, important, and climatically suitable industry is threatened with extinction if the assertion of the present proprietors of the plantations is correct—namely, “that it is absolutely impossible to conduct the work of the plantations in the tropical zones with white labour and find the industry profitable.”

Notwithstanding this assertion of those who through experience are most likely to know, there are others who maintain that, though the industry will undoubtedly receive a check to its extension, and probably suffer for a time a reduction in its present status by the withdrawal of black labour, still it will revive and become more permanently established upon a system of divided management, inasmuch as the cane-growing will be undertaken by farmers, each cultivating his own moderate-sized area of land, while the manufacturing will be the business of the mill-owner, just as is the case with the wheat-grower and the miller.

Somewhat similar is the view of the matter held by the Government at present in power. Recognizing, however, that the growers would be more likely to pull together if they worked upon the co-operative principle, they have fallen in with a scheme mooted by some of the

farmers in the Mackay district, that the Government should lend a certain sum of money, duly secured by mortgage upon congregations of cane-farms, for the purpose of erecting mills and machinery for the manufacture of sugar, and such mills to be under the management of the farmers as per certain approved regulations. For the erection of mills, under the above scheme, in suitable and approved localities a sum of £50,000 has been voted by the Legislative Assembly, in the hope that it will solve in the affirmative the question whether white labour will produce profitable sugar, even in the tropics.

Such being the outlook from a commercial and political point of view of this important industry, it will be unnecessary in this paper to enter minutely into the size of the mills and the general details of management. Instead thereof a *resumé* of the present state of the industry in each locality will be more useful to the reader seeking information upon the subject.

THE SEMI-TROPICAL DISTRICTS.

The NERANG RIVER is the most southerly of the many small rivers of Queensland. It enters the Pacific Ocean about forty-five miles south of Brisbane. The fertile alluvial soil of the river's banks was early chosen by farmers for cultivation purposes, and sugar-cane was found to thrive fairly well. It is not likely that these lands will continue to be for long allotted to cane-growing, as they have of late attained a value as dairy farms, owing to the rapid growth of the adjacent town of Southport as a fashionable and popular watering-place for Brisbane residents. There are only two or three mills of small capacity now at work manufacturing sugar, and the area of land under cane is yearly decreasing.

The COOMERA RIVER is some ten miles nearer Brisbane, and it debouches into the southern end of Moreton Bay. The soil is of a similar character to that of Nerang, and, indeed, of all these southern rivers, and is very fertile, friable, and of great depth. Originally it was covered by a dense mass of jungle or scrub, the constant decay of which for untold ages has left inexhaustible stores of fertility in the shape of vegetable mould and nitrogenous compounds. Considerable energy is at the present time being shown by the mill-owners in this district. One completely new mill having been lately erected and worked for the first time during the past season, and to another a refinery has been added. Altogether there are four mills in full work. The yield this past season has been very good, notwithstanding the frosts were severe in some places and cut down many acres of the cane. There has been a considerable additional area of land planted with cane for the coming season's crushing.

The LOGAN and ALBERT RIVERS, after junctioning, also flow into Moreton Bay, about twenty-five miles south of the Brisbane River. Upon the banks of these two rivers there are no less than twelve mills fully employed.

The peculiarity of this district is that it is here that the subdivision of cane-growing and manufacturing of sugar among a number of farmers has been carried out to a greater extent than anywhere else in the colony, and, as it is this special feature that is expected to solve the question as to whether the industry can be profitably carried on or no, it will be as well to, in this essay, dwell a little upon what is now being done.

The mills, hereabouts, are none of them of large capabilities; their capacity ranging from one ton of sugar per day to three tons. It has been only during the past season that the vacuum pan can be said to have been universally adopted, and the mills are a long way behind the large establishments of the North in modern improvements. The evaporation of the juice is still done by means of the direct fire to a long open pan, the application of steam to this purpose being unknown. There is not to be seen in the district any steam battery, concentrator, Aspinall pan, triple-effèt, filter-press, cane-carrier, travelling cooler or double-crushing rollers—all of which labour-saving improvements are common in the northern districts. Neither is the most made of the “megass” or crushed cane, which, instead of being used as fuel or as manure, is allowed to accumulate in useless heaps. Mention is made of these details here because, in the opinion of many, unless these improvements are adopted there is very little chance of the industry being profitably carried on at present market prices. In other words, the system of small holdings and small mills here initiated, and from which so much is expected, does not get a fair trial.

Several of the mills in this district are proprietary establishments—that is, they are owned by a company of from four to eight farmers, exclusively German colonists. Each partner has his cane crushed in turn, and has to cut it and top it. He is credited with the amount of 5s. per ton as it lies on the ground, the mill manager carting it. Then, again, he is credited with 6d. per ton additional for every £1 per ton, that the whole average of the season’s make of sugar exceeds £10 per ton when sold. At but few of these mills and farms is black labour employed, for the German farmers assist each other, and also make great use of their women, boys, and girls for all the manual labour. Crops were good this past year, and these proprietary owners do not intend ceasing operations. But much of the cane grown in this district is on the land of farmers who have no share in a mill, consequently the only market for their cane is to sell to the nearest proprietary that will buy, and the price now being paid to these outsiders is only 6s. 6d. per ton of cane delivered at the rollers. This figure will not pay, and much cane has been ploughed out since last season, and other crops substituted. The price of sugar being now on an average about £15 per ton, the manufacturers assert they cannot afford to give more than the figures quoted for the cane. If so, then the farmer must certainly cease attempting to grow it, for, even with unpaid family labour, it cannot be done. Whether this asse. tion is the true state of the matter, only time will show. This

past season the mill-owners have themselves had heavy crops, and so are independent as to purchasing from growers. Doubtless if more mills were to be erected, fitted with modern appliances, the competition would be greater, for more work would be got through, and the price to the farmer be raised to a fair-paying figure. It is interesting to note this fact, for in the North where the better class of mill has been erected, capable of turning out as much sugar in one day as the largest of these southern mills do in a week, the price paid to growers is just double the amount mentioned. At even 8s. per ton standing in the field farmers could profitably grow cane, and it is exceedingly likely that by next season this price will be given.

Many of the sugar-estate owners in this district are developing other resources than sugar out of their properties. Saw-mills are being erected to utilize the machinery during the non-crushing season; brick-fields are being started, coal hunted for, and dairying, horse-breeding, and other farming occupations entered into. Again, these lands, owing to their proximity to Brisbane since the opening of the Logan Railway, are so rapidly increasing in value as suburban property, that the time is not far distant when they will be classed as too valuable for mere sugar-growing. Such has been the case with those pioneer plantations that used to line the Brisbane River and dot the shores of Moreton Bay, nearly all of which are now converted into smaller properties purchased by town residents and business men. So that sugar growing and manufacture in the near neighbourhood of Brisbane is reduced to only two factories.

Proceeding northwards from Brisbane, in ten miles the Pine River is reached; here there is one mill and distillery at work. Fifty miles further north still there are two small rivers, the Maloolah and Maroochy. In this district there are many farmers, and the sugar industry was expanding rapidly until checked by the recent depression. At the head of the Maloolah is the Buderim Mountain table land, upon which are settled several farmers, and where there are two mills producing about 500 tons of sugar annually. On the Maroochy there is another mill of about the same capacity at work. The area under cane in the locality will be diminished after this year, for farmers find it more profitable to grow maize, bananas, potatoes, &c.

About fifty miles northwards of the Maroochy the Mary River enters the sea in Wide Bay. Of this district Maryborough is the principal town. On the river the sugar industry has long been established, but it has taken a different form of development to what it has done either in the South or the North. The farm system of cane-growing is still the custom, but there was early erected by Messrs. Cran and Co. the gigantic refinery, Yengarie. This is of colossal extent, and is fitted with the most approved and perfect appliances of modern times. The peculiarity of the system attached to this refinery is that the juice only is transported to it, and there are no less than 25 crushing mills supplying this juice. Therefore every farmer must have his own mill fitted with crushing machinery, but not with evaporating-pans. This system throws a great deal

more labour upon the grower, for he has to cut, cart, and crush his own cane. It also requires him to possess a large amount of capital before he can commence as a planter. The juice after being heavily charged with lime to prevent acidity, is transported to Yengarie either in trucks, or carts, or punts on the river, or by an extensive system of 3-inch underground pipes connecting the farms with the refinery, which by the aid of its powerful pumps draws the juice for miles. The amount of juice that will this past year have been forwarded to this one refinery was estimated at 4,500 tons of 2,240 gallons each. The price paid for this is £15 per ton. Last year £17 10s. was given, and in previous years £22. The growers are dissatisfied at £15, and contend that it by no means takes 2,240 gallons of juice at 10 deg. B. to produce a ton of sugar, and they assert that if a competitive refinery was established, that the extent of cane-growing in the district would largely increase. The manual labour employed in the district is that of Pacific Islanders, but there is besides a large staff of ploughmen, mechanics, and skilled European workmen. Besides the Yengarie refinery there are seven mills at which sugar manufacturing is carried on. The gross output this past season cannot have been far short of 5,500 tons.

Another fifty miles' journey in a northerly direction and the Burnett River is reached. Upon this the town of Bundaberg is situated. Here the sugar industry has of late years progressed with great rapidity, for the soil and climate were found very suitable. The district is thickly settled, and the whole of it would ere this have been under cane but for the wave of depression. The system in vogue is identical with that upon the Mary River, only instead of Yengarie there is a similar gigantic refinery, Millaquin, which, day and night, draws its supplies of juice through miles of pipe arteries connecting it with the various plantations, or from punts in which the juice is floated down from riverside farms. No mills have actually ceased work on account of the existing depression; on the contrary two additional ones have started during the past season for the first time. Still many owners who purchased estates at high figures have felt the full effect of the fall in values. The season's output probably reached the high figure of 12,000 tons. On the Kolan River, a few miles to the north of the Burnett, there are also two mills at work. Taking all things into consideration the sugar industry may be said to be in as satisfactory a position in the Burnett district as in any other in the colony. The output will probably show an increase of 6,000 tons over that of the previous year, and there is undeveloped land enough in the Woongaroo Scrub alone to support a second "Millaquin."

Exactly upon the tropical line is that large river the Fitzroy, upon which is situated, some forty miles from its mouth, the important town of Rockhampton. The sugar industry has never made headway here, chiefly because of the absence of the usual jungles upon the river banks, and because of the comparative dryness of the climate. During the past season a mill was opened at Yeppoon on the coast,

near the mouth of the river, and, so far, has proved satisfactory. This is the only one in the district, and there is but very little probability of the industry extending beyond it.

THE TROPICAL DISTRICTS.

MACKAY.

At the mouth of the Pioneer River, ninety miles north of the Tropic of Capricorn, is situated the town of Mackay. It is in the district surrounding this town, taking a radius of twenty miles, that the sugar industry has attained to its greatest expansion in the colony. The soil is fertile and the climate has been found most suitable for cane culture. Here may be said to be the commencement of the zone of tropical rains, the average fall being not less than eighty-five inches during the course of the year. The amount of capital that has been expended upon the development of the plantations and the erection of mills is truly enormous, and will run into more than two millions of pounds sterling. The mills, all of large size and capabilities, are fitted up with every modern improvement in the art of sugar manufacture. There were during the past season twenty mills at work out of a total number of twenty-six erected in the district. These mills have a nominal capacity of 30,000 tons. The system of working pursued is different to any hitherto referred to in this essay, inasmuch as a large private estate is attached to each mill, and there is no system of pipe arteries for conducting juice from farms and plantations that merely grow the cane. The great amount of capital sunk in these mills and estates (few of which have cost less than £50,000, and several as much as £100,000 and more to bring into working order) necessitates that the proprietary should have a large area of cane to rely upon for returns; thus are to be found from 300 acres to 1,500 acres under cultivation with cane upon each of these plantations. Farmers' cane, also, is bought by any and every mill, but it is considered only of secondary importance compared with the quantity grown upon the estate itself. The magnitude of these private mills may be imagined from the fact that the daily output ranges from five tons for the smaller mills up to twenty, thirty, and even more for the larger. Miles of private railways are laid down on the estates; powerful steam ploughs are to be seen tearing up the land to a great depth; a score and more of ploughmen, each with his well-kept team of three fine horses, can be seen leaving the stables in the morning to work side by side in the one extensive field. The electric light is used to light the mills, hundreds of sable labourers may be noted cutting the cane; and it is no uncommon sight to see a hundred carts employed by only the one mill carting cane to satisfy the voracious appetite of the powerful crushing rollers. Thousands of tons of firewood are required to keep the mills at work, and the six months of the crushing season may be classed as one long day of bustling work. Mackay has prospered with this prosperity until it has risen from absolutely nothing to be a bustling and important town, for its streets are thronged with drays and waggons bringing in sugar from

the mills and returning with stores; and its wharves are crowded with shipping busy with the loading and discharging of cargo.

The fall in the value of sugar and the uncertainty of sufficient labour supply being available caused a considerable depression to ensue; but this late season's work shows a decided rally. The output from the twenty mills at work, as far as can be judged at the time of concluding this essay, must have been 18,000 tons. For next year's crushing there will, in all probability, be 20,000 acres of cane, equal to an advance of 12 per cent. for the year. So it will be seen that confidence in the success of the sugar industry is still paramount among those who have had most experience in the matter, and have invested the greatest amount of capital.

The position of the farmer-class of cane-growers in this district cannot be considered a satisfactory one. In consequence of the unusually heavy crops and reduction in quantity of available labour, the mill-owners, who were not under agreement to purchase cane from the farmer, have not been at all anxious to do so; and in many cases the growers were not able to sell at all, and cattle have therefore been turned into the paddocks. The price given for cane has varied from 7s. to 10s. per ton where no agreement existed, and from 10s. up to as high as 13s. per ton where there was a contract to buy. These prices, it will be observed, are considerably higher than that paid by the small mills in the southern districts of the colony.

It was in this district that the movement originated among the farmers who could not sell their cane, for Government aid to enable them to erect central mills for the manufacture of sugar only; that is, there would be no land attached to the mill from which it could be supplied with cane, but the mill would be placed centrally among a number of farms, the owners of which agree to cultivate a certain amount of cane for the mill, and are willing to mortgage their properties as security that they will fulfil their part of the contract. As before stated, the Legislative Assembly have voted £50,000 for this purpose, in the hope that the scheme will show that it is feasible in the tropical zone to grow and manufacture sugar without the necessity of employing coloured labour. The farmers entering into this scheme assert that they can so grow and manufacture it if only the Government will advance the money to erect the necessary plant. The first of these mills will therefore be erected at Mackay; and the experiment is looked forward to with great interest by all the colonies.

THE BURDEKIN RIVER DELTA LANDS.

The Burdekin River is the largest in the colony, owing to the immense area of mountain land that it drains. Unfortunately, it is not navigable, being obstructed even from its very mouth by successional shifting sandbanks. The channel of this mighty watercourse, even prior to the point where it is influenced by tidal waters, is one mile wide. Its embouchure into the sea is about 100 miles south of Townsville. During the rainy season a roaring torrent pours down the enormous channel, sending a dark stream seaward for 60 to 100

miles, sometimes causing passing vessels unknowingly to deviate from their course; and in one case it was the cause of the wreck of a powerful steamship, accompanied by great loss of life. These tremendous flood-waters have, in the course of untold ages, washed down millions of tons of debris, forming a level delta land, high and dry. The eager eye of the sugar-planter soon discovered that the locality was likely to be the very place for successful cane-growing, and the whole of the delta land is now divided into estates and much of it under cane. The soil for the greater part is of great depth and fertility, is level, and is easy of culture. Also underlying, at the depth of from 12 feet to 20 feet, is an inexhaustible store of water in a bed of sand—indeed, it is presumed that the river runs underground. Here it is that the irrigation of the cane-fields has been chiefly adopted. The climate is by nature a drier one than that of any other sugar district in the colony, for although situated considerably within the tropics, the average rainfall is not more than 30 inches, and the winter and spring months are almost rainless. This fact has forced on irrigation. The method adopted is that of powerful steam engines turning centrifugal pumps of large diameter, the water being allowed to run down furrows between the rows of cane. The results are most satisfactory. The yield being increased from about 1 ton of sugar per acre to even 4 tons. The gentle undulating contour of much of the land admirably adapts it for the flow of the water. On the level belts a greater difficulty is experienced in this respect. The mills of the district only number five, but they are all of modern design, and large capabilities. Their total capacity is about 60 tons per day, which could be doubled by working night shifts. At least half-a-million of money must have been spent upon these fine plantations before they were declared in full working order. This district is feeling the depressed state of the sugar industry perhaps more than any in the colony, at any rate it is the only one in which there will be a large decrease in the acreage of cane for next season's crushing. The reason of this is that it was not until after a few years of experience that the dry nature of the climate was found out. Crops in the meantime had not yielded what was expected of them and what they should have done to warrant the enormous expenditure of initiatory capital that was incurred. Then came the fall in the value of sugar, and the scarcity and dearth of coloured labour. Irrigation is, however, rapidly putting a brighter face on things, and in all probability there will be 800 acres so watered during this coming winter. If so, it is not at all unlikely that the gross output next season will be considerably more than it is this year, notwithstanding that the area of cane will be reduced. As far as can be gathered at the time of writing this essay, this season's output has been about 2,600 tons.

THE HERBERT RIVER.

About 170 miles north of the Burdekin is the River Herbert. Sugar-cane has been grown on its banks and sugar manufactured in its mills for several years past. The climatic conditions are decidedly

tropical. It is in this latitude that the high mountain ranges approach close to the coast, and, attracting the water-laden clouds drifting in from the sea, cause an abundant rainfall, averaging 100 inches per annum. On the lower part of the river, the banks of which were originally covered with a tropical jungle, the soil is of that rich vegetable-mould character peculiar to such scrub lands. There two plantations were early formed, which of late years have developed into gigantic establishments owned by capitalist merchants. On the upper river country there is a large area of plains'-land. This also has of late years been converted into sugar estates, the property of wealthy proprietary companies. There are only five mills in the district, but they are of the largest capacity. The energy that has been shown in converting these lands into plantations is most commendatory; no money has been spared, and every possible aid that capital and skill could obtain has been brought into requisition. On one plantation there are no less than seventeen miles of permanent railway laid down, connecting the mill with a number of farms and with deep water carriage; four locomotives are required to draw the traffic; electricity lights the mill at night; and there are 2,000 acres under crop. Fowler's powerful steam ploughs, cultivators, and harrows can be seen constantly at work, as well as scores of ploughmen with their teams, and there are hundreds of labourers. This same proprietary—the Colonial Sugar Company—has a duplicate gigantic establishment at Homebush, some fourteen miles from Mackay. The other four estates in this district are only one degree smaller in their importance, and altogether from the five mills there will be turned out nearly 8,000 tons of sugar by the time this season closes. For two successive seasons the fields upon the plains'-land were visited by myriads of locusts, which almost destroyed the young cane. This past year, however, there has been no appearance of them. This locust plague has been the only drawback experienced by the sugar-cane grower in this district.

The shipping town for both the Herbert River and the Burdekin districts is Townsville, situated midway between the two districts. Around this town no mills have been established, but it felt the full benefit of the extension of the sugar industry, and, like Mackay, rapidly rose to importance in consequence. Small steamers communicate with both these sugar districts several times weekly, taking passengers and machinery, and returning with sugar for shipment from the town.

THE RAINY ZONES.

THE JOHNSTONE RIVER.

The zone of heavy rainfall, which commences at Hinchinbrook Island at the mouth of the Herbert River, culminates in its intensity upon the lands of the Johnstone River and Cairns districts. The high range of mountains which, like a back-bone, run through the whole of the continent from north to south, and which form the Snowy Mountains of Victoria and the Blue Mountains of New South

Wales, reach their greatest Queensland height in Mount Bellenden-Ker, whose summit is 5,500 feet above sea-level. This large mountain, and several other peaks of very nearly the same altitude and size, here approach close to the sea-coast. They consequently intercept the trade winds while still laden with moisture from the Pacific Ocean, and cause a rain precipitation averaging the enormous quantity of 160 to 180 inches per annum. The result is a hot-house flora of tropical luxuriance, a soil unsurpassed on the earth's surface for fertility; a jungle-land typically tropical—the delight of the botanist, the wonderland of Australia! The first sugar-planter who attempted sugar-cane culture in this favoured district was T. N. Fitzgerald, who had been one of the pioneers of the industry at Mackay. This gentleman, in the year 1880, secured a large area of the Johnstone River lands, a region of impenetrable jungle so dense that not a house could be erected till the scrub was cleared off, not a track could be got through the forest till the axe cleared the way. This bold pioneer deserves great credit for his enterprise, for the popular opinion was that the climate was too tropical for successful sugar manufacture. It was admitted that the cane would grow, but it was expected that it would be too luxuriant, too rank—that is, that there would be great development of cane and a large produce per acre, but that this would be accompanied with a superabundance of juice, the sugar properties of which would be too diluted and mixed with albuminous and other impurities to granulate properly. The soil of these rainy districts is a vegetable mould many feet in thickness, the result of centuries of decay of tropical jungle. It is consequently amazingly fertile and inexhaustible in this fertility. The heavy rainfall has, during the course of ages, washed down from these high mountains (which are themselves densely clothed with verdure) immense quantities of detritus, and deposited it as a comminuted organic mould upon the flat lands that border the many creeks and rivers that here flow into the sea.

Other settlers soon followed Mr. Fitzgerald, and now the flourishing little town of Geraldton has sprung up where three or four years ago was forest solitude. Besides the Innisfail plantation started by Mr. Fitzgerald, there are two other large mills in this district. Both of these commenced manufacturing in 1884. The machinery with which they are fitted is of the best and most modern description, and the amount of capital expended before the estates were in working order was equally great as that spoken of in other districts. It is pleasing to have to record the entire success of these ventures as regards the quality of the sugar. Indeed the sugars from the Mourilyan Company have assumed quite an authoritative standard. Thus did actual experiment completely dissipate the fears that first-class sugar could not be produced from cane grown in these rainy zones; the cane-growth proved to be grandly luxuriant, as had been expected, but it was healthy, not developing any of the rust-fungus, or other disease, and the yield per acre of sugar is nearly double of that on any other district in the colony.

THE CAIRNS DISTRICT.

North of the Johnstone River, and distant 160 miles from Townsville, is the town of Cairns. The characteristic of the climate and country here also is grandly tropical. In fact, Cairns may be said to be the central pivot of the garden of Australia. On every side of it is dense jungle of tropical flora, containing towering graceful palms, ferns, lycopods, orchids, and rare flowering shrubs. The utilitarian hand of man is laying all this natural beauty low and substituting economic cultivation. In 1880 this locality first attracted the eye of the sugar planter, but capitalists were shy of it, fearing the too tropical nature of the climate. Some Chinese started the first plantation, calling it "Hap Wah," or "Good luck" Company. Their example was speedily followed by a Victorian proprietary, who, at Hambledon, have created a plantation vieing in its extent, and in the perfection of its machinery and arrangements, with the plantations and mills of any other district in the colony. Capital was freely spent, with the result that the cane-growth was most extraordinary, and the yield of sugar per acre for the season 1883-4, from 700 acres, was over 1,400 tons, a higher average than that produced from any other plantation in Queensland during that bad season. A refinery has lately been added to the mill, and also other improvements, so that it is expected over 1,500 tons will be the result of the season now concluding.

About ten miles beyond Hambledon is the Mulgrave River, upon which is one plantation—the Pyramid. The land here is of the same jungle nature and fertility. This is one of the few large mills that have started work for the first time during the past season. It is equal to 2,000 tons, capacity, but, in consequence of initiatory difficulties, in all probability not over 1,000 tons was produced this season.

PORT DOUGLAS.

Still proceeding northward, the next locality where sugar has become established is on the Mossman River, fourteen miles from Port Douglas. Here there is one plantation in full working order, and equal to turning out twenty to twenty-five tons per week. The soil is a scrub deposit and the climate also truly tropical and humid.

THE BLOOMFIELD RIVER.

North of the Mossman, but just south of the Endeavour River, upon which is situated Cooktown, is the River Bloomfield. Here is the most northern mill yet erected for the manufacture of sugar. It is the property of Messrs. Bauer and Company, who, like all the other sugar estate owners in the north, have spent much capital in developing their properties. The mill is equal to producing ten tons per day.

CONCLUDING REMARKS.

By reading over this essay the reader will thus become briefly acquainted with the rise of the sugar industry in Queensland, its gradual development, its trials, and its success, and its position

at the present day. He will see that wherever it has been planted it has been successful, no matter whether in the colder latitudes of the South, the dry region of the Burdekin, or the rainy zones of the Tropics. He will note that the energy and skill of the colonist has been such that climatic difficulties were in each of these localities overcome, and a first-class sugar manufactured. The conclusion, therefore, is that the sugar-cane is a plant pre-eminently suitable for culture in this colony. He will note that in the South the system in vogue has been so shaped that it embraces small-sized mills with peasant proprietorship, as befits the closer settlement by a class of German farmers, the greater abundance of European labour, and the cooler climate. That in the middle districts, where there is still a close settlement and a moderately cool climate, the same principle of farm cultivation is in practice; but that the manufacturing is undertaken by refineries of gigantic size and capabilities, whose underground pipes are as an arterial system drawing the life-giving cane-juice from the widely-separated farms. But that, as soon as the tropical line is crossed, the development of the industry has only been effected by a system of large estates, owned by capitalists who have spent freely their tens and tens of thousands of pounds before gaining any returns; and that attached to each of these mills is a large area of cane, the cultivation of which is only carried out by the employment of hundreds of South Sea Islanders as labourers. The suitability of this system of working for the tropical regions is evidenced by the fact that every establishment started, from Mackay northwards to Cooktown, has been founded and carried on to success on these lines.

The essay also shows that one large town has already been created by the growth of the sugar-cane in its neighbourhood; that other towns were rapidly increasing in importance through the same cause, and that wherever the planter pioneered the way, no matter how dense the jungle, how inaccessible the rivulet, the unpretentious but bustling little township was sure to follow. It shows the whole coast line from the New South Wales boundary to Cooktown—a distance of nearly 1,300 miles—is dotted at intervals of from 50 to 100 miles, according as there are creeks and rivers, with centres of this industry—centres which, but for the present check owing to the fall in price of sugar and the uncertainty of a due labour supply, would have spread until hundreds of thousands of acres would have been under waving sugar-cane; happy homesteads would have been created by thousands, and a gross production from the soil obtained which would have surpassed all the returns from all the rich resources of this rich colony.

It is the opinion of many that this will even yet take place. That there will be a reaction of capital in favour of sugar-growing and manufacture, as great as is commonly seen after depressions in other occupations. That better machinery and a better system of working will be discovered; that the necessary labour will be forthcoming, and prosperity again reign, though the profits may not be so great. The

inexhaustible fertility of the tropical scrub soils of the colony, the immense area of them still untouched, their freedom from all possible drought, and their extreme suitability for cane growth, all point to the promise that this reaction must set in.

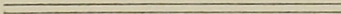
When it is considered that the returns from the industry for this past season, as far as can be calculated at the time of concluding this paper, in all probability will reach the high figure of 50,000 tons, of a value of nearly £1,000,000, and that all this is actually produced from a mere handful of soil, it is but a fair conclusion that an occupation that promises so much will not be allowed to drop.

THE PASTORAL INDUSTRY:

BY

P. R. GORDON,

CHIEF INSPECTOR OF STOCK, Etc.



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THE PASTORAL INDUSTRY.

By P. R. GORDON.

GENERAL REMARKS.

By far the larger proportion of Queensland is occupied for purely pastoral purposes.

The total area of the colony is 427,838,080 acres. Of these, 11,191,134 acres had passed from possession of the Crown up to 31st December, 1884, viz.: 7,099,215 freeholds by direct purchase from the Crown, 3,446,026 under conditional purchase (*i.e.*, deferred payments), and 645,893 under homestead selections (*i.e.*, small areas, deferred payments, and absolute personal residence).

The area of Crown lands held under lease or license for pastoral purposes is 308,669,760 acres in the unsettled, and 7,444,000 acres in the settled districts. A very large proportion of the alienated and conditionally purchased land is also occupied solely for pastoral purposes.

The stock are fed almost entirely on the indigenous grasses, the only exceptions being some portions of the alienated lands near the coast, and on the Darling Downs immediately to the west of the coast range, where either lucerne (*Medicago sativa*) or Californian prairie grass (*Bromus unioloides*) is cultivated, principally for the purpose of fattening store cattle and sheep for the metropolitan market.

The pastoral lands in the unsettled districts are held under lease for twenty-one years, at an average yearly rental of 12s. 5 $\frac{3}{4}$ d. per square mile of available area, or '935 of a farthing per acre, subject, however, to resumption by the Crown on a vote of both Houses of Parliament, if required for *bona fide* settlement.

The unalienated lands in the settled districts are leased for a term of five years, the average yearly rental being £2 0s. 11 $\frac{3}{4}$ d. per square mile, or '766 of a penny per acre.

The number of "runs" or blocks leased for pastoral purposes, is 9,208 in the unsettled, and 334 in the settled districts. These numbers, however, do not represent the number of Crown lessees, as in most instances each lessee occupies a large number of blocks, which are consolidated and worked as one run or squattage.

In the unsettled districts there is still an area of 97,601 square miles unoccupied, in addition to 112,197 square miles unavailable for pasturage, principally through being covered with scrub (jungle).

The Land Act passed in the session of 1884, which has barely yet been brought into operation, will make considerable alterations in the conditions of pastoral settlement. This Act does not apply to the extreme west and north of the colony, which will continue, as before, under twenty-one years' conditional leases. In other portions of the colony it will be optional with the pastoral lessees of the Crown to bring their runs under the operation of the Act. This optional provision is being largely availed of, and it is expected that a very large majority of the pastoral lessees will elect to come under it.

The whole of the blocks in the occupation of one lessee, after having been consolidated into one run, will be divided into two equal parts, one of which will be resumed by the Crown, and the Crown tenant will obtain a fifteen years' indefeasible lease of the remaining half in the unsettled, or ten years' lease in the settled, districts, at a rental to be fixed by the Land Board. The tenant will have the option of occupying the resumed portion on a yearly license, and at a rental to be fixed by the Land Board until it is required for settlement, subject to a deduction of rent proportionate to the area from time to time selected. Under this Act a new class of pastoralists will be created, for the first time in the Australian colonies.

From the resumed portions of runs, grazing farms, not exceeding 20,000 acres nor less than 2,560 acres in extent each, may be selected on leases of thirty years, at a yearly rental of not less than $\frac{3}{4}$ d. per acre, subject to conditions of *bona fide* residence, and to the selection being fenced in within three years from the issue of the license. These grazing farms will afford opportunities for men of limited capital to embark in the business of graziers, denied them under the present system; and with favourable seasons it is anticipated that the production of wool in the colony will, in consequence, be very largely augmented in the course of a few years.

In a colony comprising such a vast area, extending from 29° to 11° S. lat., and from 138° to 153° 40' E. long., the variations in topographical features, geological formations, temperature and climate, must necessarily be considerable. Each of these conditions exercises a potent influence on the pasture, and necessarily also on the stock. Thus, whilst the rank natural vegetation along the coast watershed, and in the tropical latitudes, affords excellent pasturage for cattle and horses, it is totally unsuited for sheep. On the other hand the fine salsolaceous herbage in the drier climate of the interior affords sheep-pasture which is not excelled and scarcely equalled in any other country.

The lands immediately to the west of the Main Coast Range, and for a considerable distance inland, are admirably adapted to the growth of fine merino wool, and here the highest quality of combing merino wool is successfully grown. Further to the westward, on the extensive plains in the interior, although the herbage affords more nutritious pasturage, and the sheep, in consequence, attain a greater weight of carcase, the more arid nature of the climate is not so

favourable to the secretion of yolk, and, as a consequence, the wool, although sound in staple and of vigorous growth, is not so free and silky, and therefore not so well adapted for combing purposes as that grown in the more easterly districts; but constitutes a superior wool for clothing purposes.

At the time of the separation of Queensland from the parent colony of New South Wales—December, 1859—the numbers of live stock in the colony were 23,504 horses, 432,890 cattle, and 3,166,802 sheep. At the end of 1884 the numbers had increased to 253,116 horses, 4,266,172 cattle, and 9,308,911 sheep. In consequence of the severe drought that prevailed during the years 1883-4-5, the losses through deaths and the absence of increase were unprecedentedly heavy, as will be seen by comparing the numbers at the close of 1882 with those of 1884; the former having been—horses, 233,776; cattle, 4,324,907; sheep, 12,042,893. With a return of normal seasons the rate of increase in sheep will be much greater, in proportion, than in the past, as, with the increasing facilities of carriage afforded by the rapid extension of our railways into the interior, large areas now occupied by cattle will be more profitably devoted to the growth of wool.

HORSES.

The horses in the colony may be classed as follows:—Blood horses, 3,000; saddle horses, 130,000; light harness, 90,000; and heavy draught, 10,000.

The blood stock are bred principally for racing purposes, although the sires in use for hack breeding are, as a rule, drawn from thoroughbred studs. The prices of this class range from £30 to £500.

The saddle horses range from half-breds to inferior, are capable of great endurance, standing from 14·2 to 15·3 hands high. Prices range from £5 to £50.

The light-harness horses may be described as the produce of well-bred, clean-legged sires from active farm mares. But a superior class of light-harness horses is now being raised by the use of Cleveland bays, roadsters, and Norfolk trotters, of which there are some very superior imported specimens in the colony. Prices range from £10 to £50.

The heavy draught stock are principally composed of the Clydesdale, Shire horse, and Suffolk Punch breeds—the first-named very largely predominating. Many breeders of this variety have gone to great expense in importing first-class sires from Great Britain. Prices for working horses of this breed, from £25 to £60, and for superior sires up to £500.

CATTLE.

Of the general herds of cattle, by far the larger proportion are of Durham or Shorthorn origin. About 2 per cent. are graded Herefords, and a small proportion of Devons crosses. Independently of

the general herds, there are a large number of superior stud pedigree herds of Shorthorns, Herefords, and a few of Devons, Ayrshires, one Aberdeen-Angus polled, and a few Alderney and Brittany. Some of the Shorthorns and Herefords are of the most fashionable blood procurable. It is the general impression that, on account of their superior hardiness, the Herefords and Devons are best adapted to the coast and mountainous districts, although the Shorthorns thrive well in all parts of the colony. Some valuable pedigree herds of Shorthorns have been established far into the interior. One—the Monkira herd—may be cited as typical of the superior herds of Central Australia. It is almost in the centre of the Australasian continent, being near the western boundary of the colony. This herd contains a number of sires and dams, direct descendants of cattle selected at high prices from the herds of the Duke of Devonshire, Earl Bective, the Earl of Dunmore, Mr. Hugh Aylmer, and some others of the most fashionable Bates and Booth herds in the United Kingdom. Although fed solely on indigenous pasturage—never being hand or stall fed—they thrive exceedingly well; and, in illustration of the readiness with which this ubiquitous breed of cattle adapt themselves to the Queensland climate and their altered circumstances, fat cattle from this herd travel over 1,000 miles to market, frequently passing over distances of 60 to 90 miles without a drop of water. The Aberdeen-Angus polled cattle afford further proof of the favourable nature of the Queensland climate and pasturage. Although natives of a rigorous and moist climate, they thrive and fatten exceedingly well in Queensland, with the thermometer frequently ranging up to 100° Fahr.

In normal seasons the price of store cattle, 2½ to 3 years old, averages £3 per head, and the price of fat cattle in the metropolitan sale-yards is from £4 10s. to £5.

SHEEP.

Of each of the two varieties of sheep in the colony—merino and coarse-woolled—there are several sub-varieties or classes. The proportion of coarse-woolled (including crosses on the merino) is about one-fifth per cent. of the number of sheep in the colony.

The merinos may be classed as fine and medium *clothing* wool, and fine, medium, and strong *combing* wool. The last-named is principally restricted to the richer pasturage and comparatively humid climate of the Downs country, immediately west of the main coast range.

Of the fine clothing description a good typical specimen will be seen in the exhibit of the Queensland Co-operative Pastoral Company, Pikedale.

Of the fine combing, the exhibits of Messrs. George Clark and Co., East Talgai; Marshall and Slade, Glengallan; Gore and Co., Yandilla; J. D. Macansh, Canning Downs (the latter of Rambouillet origin), are favourable specimens.

The medium combing is also well represented in the exhibits of the above-named breeders, as well as by those of the Darling Downs and Western Land Company, Jimbour, and the Queensland Land and Pastoral Company, Daandine. Typical samples of strongest merino combing will be seen in the exhibits of Mr. C. B. Fisher, the Darling Downs and Western Land Company, and the Western Queensland Pastoral Company, Burenda. Specimens of the wools grown in the higher latitudes are also exhibited; but in consequence of the severe drought prevailing throughout the whole of the year, none of the wool exhibits are fair specimens of the average clips.

The coarse-woolled sheep are principally of the Lincoln breed, but Leicesters, Cotswolds, Shropshire Downs, and South Downs have also been introduced, and produce excellent sheep when crossed with the merino. The wool of the Lincoln-cum-merino is a very valuable lustrous combing wool, realising good prices in London.

A clip of Queensland black wool attracted considerable attention in England during the 1885 sales, from the fact that it realised by far the highest average of any clip in grease during the series. As much interest is attached to this flock, which is yearly increasing in numbers, Mr. William Allan, the owner and founder of the flock, has kindly supplied the following information concerning it.

Origin of the Black Merino flock of Sheep presently at Brae-side, Dalveen, Darling Downs, the property of Mr. William Allan.

Mr. Allan had for many years been managing and breeding merino sheep in New South Wales and Queensland. During that period he noticed that the purer the stock were, it seemed to him, the more often black sheep appeared among them, notwithstanding that every sheep having any coloured spot about it was rigidly excluded from the stud flocks. It therefore occurred to him, the strain proving so strong and apparently impossible to obliterate, that probably the original merino sheep had been principally black, and by continuous culling for centuries had been brought to the present prevailing colour. He determined therefore to try, if, by putting black sires to black ewes, these would reproduce in any quantity the like colour. To his surprise, he found that in every case it succeeded, and no white lambs resulted. A small white spot on the forehead, and small white tip to the tail, is almost universal.

This experiment was commenced in 1877-78 on a very small scale, and the flock, carefully culled, does not even yet reach 1,000 sheep.

The results have more than realised Mr. Allan's most sanguine anticipations. In picking sheep for the coloured flock, Mr. Allan makes it a *sine quâ non* that the tongue and roof of the mouth is black.

Some of the characteristics of these sheep are, that they appear much hardier and more active than the white merino, and

although they do not become so prime, they do not suffer so much in drought or bad seasons. The mutton, somewhat dark in colour, is sweeter and of a gamey flavour.

The wool keeps up its character for quality and quantity; and, at the sales in London of 1885, the fleece-wool of this flock, all round, in grease, brought 1s. 6½d. per lb., quite double the average in same sales of white merino wool, in grease. The cloth manufactured from this wool is of a fine dark coffee-colour. This can be rendered any lighter shade, of course, by an admixture of white wool. Mr. Allan has also a small flock of gray sheep. The wool from these produce a very pretty material.

The advantages of cloth made from this black or rather dark-brown wool (for no sheep produces absolutely *black* wool), are very various.

The cloth, when properly bleached before finishing, does not fade. Dyes, nearly all more or less, contain matter which destroys the fibre of wool. This, being free from dye, lasts much longer, besides keeping its colour.

More important, however, is the fact (especially for coloured underclothing) that many dyes contain poisonous matter. To some extent this necessarily enters the pores of the skin, and, as now well ascertained, is responsible for various ailments previously unaccounted for, or attributed to other causes. This has occupied the attention of German *savants* more than it has their English compeers, and has had the effect of drawing public notice to black and gray wools. Braeside, where this flock runs, is a granite and slate country, 2,800 feet above sea-level, and about 100 miles from the coast, on the western waters of one of the heads of the Murray River. All the sheep in this flock not bred by Mr. William Allan himself were purchased by him from the following well-known merino sheep breeders:—

Sir Joshua Peter Bell, Jimbour, Darling Downs.

Sir Patrick Jennings, Westbrook, Darling Downs.

J. D. Macansh, Esq., Canning Downs, Darling Downs.

Messrs. Kent and Wienholt, Jondaryan, Darling Downs.

C. B. Fisher, Esq., Headington Hill, Darling Downs.

Messrs. Simpson Bros., Bon Accord, Darling Downs.

North British Company, Rosenthal, Darling Downs.

Samples of this clip, both in fleece and in bale, are exhibited in the Queensland Court.

Disease.

Perhaps in no other part of the world do the live stock of the farmer enjoy such an immunity from disease as in Queensland. Scab in sheep has never existed in the colony, foot-root may be said to be unknown, and, with the exception of the few sheep kept on the coast watershed, fluke has no existence. There have been occasional cases

of catarrhal fever—a virulent disease—but on each occasion it has been promptly stamped out by the destruction of the infected flock, the owners being compensated from a fund accruing under “*The Diseases in Sheep Act*” from small annual contributions (five shillings per 1000 sheep) levied under that Act, to cover the cost of inspection and the prevention of diseases. In seasons of severe drought, when there is little nutrition in the grass and herbage, considerable losses have occurred in some portions of the colony, from the presence of intestinal worms (*Strongylus rubescens*), but such cases are unknown when feed is abundant, and in districts where the herbage is of a saline nature.

Pleuro-pneumonia, which, on its first introduction—20 years ago—occasioned considerable loss in cattle, has now, by acclimatisation, assumed such a mild type that the losses from it are trivial. This is particularly the case where inoculation (which is very generally believed in as a preventive) has been resorted to.

Anthrax, Splenic apoplexy (locally termed “Cumberland disease”), occasionally appears, but its ravages are by no means serious, and are confined to certain districts of limited extent.

A few cases of tuberculosis appear in the herds in the coast districts, but the climate and the system of grazing in the open air, summer and winter, are evidently inimical to pulmonary diseases in stock of all kinds.

A system of compulsory registration of brands of cattle and horses has been in operation since 1872, and is the most complete of any system yet adopted by any other colony or country, both as a protection against theft and for the recovery of stray or stolen stock. By that system each brand is restricted to two letters and one numeral, and the changes that can thus be rung on the alphabet and ten numerals are almost unlimited, so that each owner in the colony is allotted a separate and distinct brand. Already over 25,000 brands have been registered, and a “Brands Directory” is published annually at the Government Printing Office, containing the names and addresses of all brand-owners, arranged according to the alphabetical and numerical order of the brands. The Brands Act provides that a certain order of branding shall be adhered to, so that the present owner of the animal is easily discovered by the last brand imprinted in that order.

The remarkable increase in the number of marsupials within the last ten years, causing devastation of the pasture, led to the passing of an Act to encourage their destruction. By that Act stockowners are empowered to assess themselves to a limited extent, and the amount thus levied is subsidised by an equal amount by the Government; and from the funds thus accruing bonuses are paid for all scalps of marsupials presented, at the rate of 8d. for each kangaroo and 4d. for each wallaby scalp. Since the passing of this Act the scalps of over 6,000,000 marsupials have been paid for, and the pest very greatly

reduced. It is subject for regret, however, that comparatively few skins have been saved, the ruling prices being insufficient to cover the cost of removal and carriage to market.

There are so many forms in which these skins can be worked up by the tanner and furrier that it is hoped the attention of British and Continental manufacturers will be directed to the matter, and means adopted to prevent the annual loss of millions of valuable skins throughout the Australian colonies.

HORTICULTURE :

BY

THEODORE WRIGHT.

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HORTICULTURE:

By THEODORE WRIGHT.

INTRODUCTORY.

Up to the present time in Queensland, horticulture, the more artistic sister of agriculture, has not been adequately represented. The hardy pioneers of settlement, in most instances, have been otherwise concerned and employed, and to a very great extent have passed it by as not being within the legitimate scope of their activity; and the more leisured and moneyed classes around our denser and older centres of population have been contented with much less display in this direction than is compatible with the tastes and instincts of the more staid and refined aristocracy of the older nations of Europe. Notwithstanding this, adventurous spirits everywhere have expended both energy, intellect, and means in experimenting, and thereby satisfying themselves, to a very large extent, as to the capabilities of Queensland's vast territory; and it is now known with a degree of probability, amounting almost to certainty, that within her varied latitudes, altitudes, climes, and soils there is hardly any limit to the range of her capabilities in horticulture. Not only does she possess a wide range of qualifications in the stretch of latitude from Cape York in the extreme north, in about 10 degrees 40 minutes south latitude, to Point Danger, in 28 degrees 8 minutes further south, to give variety to her productions; but she enjoys also a widely marked difference between her coast territory and the western interior, so that nearly all the productions of the temperate, sub-tropical, and tropical areas of the globe are fairly within her scope, and may be grown to advantage.

ACTUAL ACCOMPLISHMENTS.

FRUITS.—In treating of her capabilities, the surest way is to set forth what has actually been done, and to some extent define the limits of territory within which good results have been obtained. The temperate region of Queensland is very limited in comparison with the rest. None of the coast country can be fairly reckoned as being within it, and yet, by intelligently selecting the seasons, most of the *annual* products of such climes can be grown almost to perfection even there. Strictly speaking, the temperate portion of Queensland is confined to the Darling Downs—a large extent of undulating, lightly timbered country, of a very fertile description, lying more than 100

miles west from the coast, and covering several degrees of her most southerly territory. Here in season may be seen fine specimens of the apple, pear, plum, peach, apricot, nectarine, medlar, mulberry, grape, fig, almond, quince, cherry, chestnut, walnut, filbert, strawberry, raspberry, blackberry, elderberry, but seldom the gooseberry or any of the currant family. On some favoured portions of the same territory may be seen the olive, passion-fruit, granadilla, pomegranate, persimmon, loquat, orange, lemon, lime, and shaddock; so that it will be seen that the Darling Downs' range of capabilities in fruit-growing are almost as extensive as her territory; and, if enterprise enough were manifested, could be utilised to the extent of supplying the wants of millions, if necessary, whereas at the present time it is very far short of supplying the wants of the sparse population now settled within the borders of Queensland. It unfortunately happens that few are sufficiently acquainted with the details of fruit-growing under the somewhat altered circumstances of climate and other matters in this colony to give it profitable attention; and these climatic and other difficulties, which must be overcome, necessarily intimidate the faint-hearted, and at the same time form a kind of natural protection to the few who have the knowledge, energy, and enterprise to undertake it. Fruit-growing in Queensland will take immense strides when once irrigation is made possible, as has already been the case in California; and it is a matter of such importance that it must be taken in hand by our legislators at an early date.

VEGETABLES.—The same territory and climate favours the production of all the vegetables of temperate climes. Immense cabbages, cauliflowers, onions, turnips, potatoes, carrots, parsnips, beets, vegetable-marrows, squashes, cucumbers, and rock and water melons grace the tables of the annual exhibitions at various points of the Darling Downs. Peas, broad beans, kidney beans, salads in great variety, asparagus, rhubarb, artichokes—in short, everything with which the European or British public are familiar are here raised in great perfection in their season. There are the climatic difficulties already referred to to contend against, but they are not insuperable; and those who apply themselves, and concentrate their energies and intelligence upon the subject, can realise as good success year by year, taking the seasons through, as is obtained in Great Britain with her shorter season of active growth. As a rule, the only chances of rest the soil gets in Queensland are the oft-recurring periods of drought, and they are not more calamitous or dreadful, if the soil be only properly worked, than are the lengthy and severe winters of colder climes, and the baneful influence of excessive and continuous moisture below; in short, they may be regarded as blessings in disguise. No doubt the exigencies of the climate demand a system of tillage the most calculated to withstand the withering effects of heat and protracted dry weather, and this will be found in deep working; a system by no means general or popular amongst Queensland horticulturists at the present time, and yet it has been proved to be, wherever fairly

tried, most satisfactory. Trenching, so well known and generally approved in Great Britain as a necessary adjunct to successful gardening, is even more imperative in Queensland on account of the climatic difficulties referred to. The system of trenching most popular in Queensland is not to turn the land right over to the full depth it is worked, thus altering the relative positions of soil and sub-soil; but after removing the upper spit or foot of soil, the second foot is thoroughly broken up where it is, and afterwards the top of the next trench is used to make up to the surface with, keeping the top always at top, and the subsoil below. In strong and heavy soils drainage is resorted to, and tiles are very largely used for the purpose, and can be purchased at our brick and tile factories at about £5 per hundred; but many effective drains are made from materials ready to hand—such as stone, wood, brush, &c. The various operations in Queensland horticulture are, however, so very similar to those employed at home, that it will serve no very good purpose to enlarge upon them here.

FLOWERS AND SHRUBS.—But a word or two is called for with reference to Queensland floriculture, and, first of all, within its temperate limits. To only a limited extent flowers receive attention at the hands of colonial gardeners. In the Darling Downs district many of the most popular florist's flowers of Great Britain attain to great perfection, and amongst the successes may be specified pansies, violets, carnations, pinks, picotees, balsams, cockscombs, amaranths, phloxes, Canterbury bells, petunias, geraniums, heliotropes, dahlias, sunflowers, Indian and Chinese pinks, mignonette, sweet peas, holyhocks, portulacas, penstemons, chrysanthemums; in short, an almost endless variety of annuals, biennials, and perennials from every clime grace the ornamental borders; edgings of box, and other British favourites, help to maintain the charm of early associations. Amongst the flowering shrubs in all temperate localities of the colony, the rose in its many varieties is deservedly popular and quite at home. The rose of old England is loved as much for the country it represents as for itself, and thrives immensely, in some of its species and varieties, over very much of Queensland. But on the Darling Downs may be seen the lilac, laburnum, laurestinus, camellia, honeysuckle, weigelia, veronica, abutilon, berberis, deutzia, duranta, euonymus, gardenia, rhododendron, hibiscus, hydrangea, holly, ivy, jasmine, laurel, magnolia, spirea, viburnum, and hosts of other ornamental trees and shrubs in great variety, besides an endless assortment of conifers and taxads from almost all the countries under the sun. There are also many other more tender shrubs and trees which contribute their quota towards enlivening the scenery. No attempt is made in enumerating these to furnish an exhaustive list of the productions of temperate Queensland; but rather, by means of selected plants, to show what the climate really is in the district spoken of. Nothing defines climate more sharply and accurately than the vegetation it can sustain, and hence the attempt to show somewhat particularly what is thrifty in these parts. Perhaps

the mention that hedges of privet and hawthorn, and trees of the British oak, elm, ash, and willow are occasionally met with in these parts, thriving perfectly where proper attention is bestowed upon them, will serve as good a purpose in this respect as many a thing that could be said besides.

VINE-GROWING.—Connected with the horticultural industry is the cultivation of the grape-vine and wine-making, and it would appear that this is almost naturally and necessarily limited to the coldest, that is to say the temperate, portion of Queensland. Viticulture is followed in all the temperate parts of the colony with marked success. Anywhere south of the Tropic of Capricorn the grape flourishes, and the more south it is grown in Queensland the better the plant likes it; for, on the other hand, in the north, within the tropics, it becomes more or less a failure. In the colder portions of Queensland wine-making is also prosecuted with a large measure of success. It is a fact that wine is very little made except in the extreme south, but that it can only be made in the south remains to be proved. Some of the greatest experts in wine-making in Queensland say that the heat of the climate is not detrimental, but helpful, to the manufacture of a good wine; there are others again who assert to the contrary. Be that as it may, Queensland wines have already attracted attention and received favourable mention outside of the colony, and as climatic and other difficulties are understood and mastered, there is every reason to believe that wine-making will grow into an immense and profitable industry. Tens of thousands of acres of suitable land are waiting for the skilled vigneron to subdue, and whosoever will may prosper in the industry, provided only skill and forethought be duly exercised in the choice of site and in the conduct of the enterprise. Mostly where the vine flourishes, the hop-plant (*Numulus lupulus*) is also at home; and experiments so far made with it go to show that hop-gardens will yet, and that before long, help to swell the totals of production in the great horticultural interest. So far the productions mentioned are such as are mostly familiar to the British public, but the resources of Queensland horticulture widen immensely in comparison with that of the mother-country, as will be seen by glancing at it in its next aspect—the sub-tropical.

SEMI-TROPICAL PRODUCTS.

FRUITS.—The whole of sub-tropical Queensland enjoys two very distinctly marked growing seasons—the winter and the summer. Unlike colder countries, there are not such marked gradations in the seasons as to sharply define four—spring, summer, autumn, and winter; so the prevalent practice is to define it as being either summer or winter in this colony. During winter, in the sub-tropics, a generally good growing season is experienced for all the annual vegetable productions of the temperate zone; but many biennials and perennials are more or less failures. During summer in these districts all the annual productions of the tropics flourish and are perfected; but

many that are not annuals are not sufficiently at home during the cold of winter to give very satisfactory returns. It is a very accommodating portion of the colony within certain limits, but when those limits are exceeded much disappointment follows. With an average moist winter all the annual vegetables and flowers popular in Great Britain are quite thrifty in the open borders in sub-tropical Queensland; and this comprises the coast country from the extreme south to the Tropic of Capricorn, amounting to more than 300 miles. Here the banana, pineapple, mango, orange, lemon, lime, many Chinese and Japanese fruits, and also some of the most hardy fruits of temperate climes, flourish moderately and give satisfactory returns. Many things mentioned above as being at home on the Darling Downs are not so here, some refusing to produce fruit with any treatment, notably the cherry, apricot, almond, nectarine, and many favourite plums, also the gooseberry and currant. A few varieties of apples and pears do moderately well in these parts; but, through not having a well-defined season of cold and rest, they lose their nature and character, and are never pre-eminently fruitful, long-lived, or vigorous. With reference to tropical fruits, such as the banana, pineapple, and mango, although they grow and pay well in Southern Queensland along the coast, they are not so great a success there as they are proving to be further north, and, eventually, there is every reason to believe that tropical Queensland will carry all before it in the production of these valuable commodities. While saying this it would be an injustice to sub-tropical Queensland to omit a few facts in connection with banana and pineapple growing. For these fruits there is a very great local and colonial demand, and growers have for years past been accumulating wealth by growing and marketing them. Both bananas and pineapples suffer from the frost, the former especially; and the banana is unprofitable except in rich alluvial lands where a fair supply of moisture is available. The pineapple requires a deep and free rather than a rich soil, and often grows to the greatest perfection in sand alone; it can also do with less moisture than the banana. Neither of these crops can be expected to give any returns the first twelve months, but after that they commence to bear lightly, and by the second or third year from planting are doing their best. Lands well adapted for the production of these valuable fruits are plentiful in the coast country of Queensland, and as the markets of the colonies are open for them, there is room for almost indefinite extension of the industry. Pineapples from 10 lbs. to 18 lbs. weight are of frequent occurrence in Queensland. In the same latitudes, by selecting the land carefully, good sites for orange groves can be found, and even greater returns are looked for from an orangery than from the fruits above mentioned. Certainly there are more and greater difficulties connected with orange-growing than with pines and bananas, and they will not endure such slovenliness and inattention; but fortunes are quite within the range of possibility if the work be only done well and intelligently. The drawbacks in orange-growing are drought, the depredations of what is called the orange moth, and the many varieties

of scale insect ; but these are all surmountable by skill and intelligence, and offer no greater difficulties to the would-be orange-grower than is incidental to the many crops upon which the cultivator in every land places his dependence. One thing the orange-grower must take into account is the length of time he must wait for returns ; he should base his calculations on a prospective term of five years without any takings worth mentioning. The tillage required by the orange does not differ in any essential particular from that which suits the fruits of Great Britain and the Continent ; still the heat and trying droughts render the best cultivation necessary.

VEGETABLES.—Most of the vegetables common to the more temperate climes flourish in semi-tropical Queensland during winter ; but in the summer the sweet potato, yam, sweet corn, several excellent varieties of tropical beans, a variety of silver beet, and Chinese spinach luxuriate, the two latter being freely used instead of cabbage-greens. While summer heat lasts cabbages can hardly be grown ; they simply exist. The principal, if not the only, market-gardeners are the indefatigable Chinese, who secure near the centres of population pieces of alluvial land well supplied with water, and plod on in their semi-barbarous style of cultivation, realising often great success, while enjoying almost a monopoly of the industry. These celestials are not by any means appreciated as market-gardeners ; but as they supply a great want, which the European population feels keenly enough but make little or no effort to supply, they are endured in that capacity. Frequently, these successful Chinese retire to the "Flowery Land" with what is to them a moderate competency as the result of a few years' persevering toil in this industry. There is nothing whatever to hinder the British gardener, with his well-known energy and superior skill, overturning this monopoly ; and there are thousands of householders in the colony who would fervently bless the enterprising man, or company, that would accomplish it.

FLOWERS AND SHRUBS.—Sub-tropical Queensland is very favourably circumstanced for the cultivation of flowers. During winter many of the old favourites, such as pansies, asters, ranunculi, primulas, cinerarias, violets, and other soft-wooded annuals and herbaceous plants, thrive admirably ; and in the summer, plants which are only to be seen in hot-houses in the British Isles are regular occupants of the border. The same remarks apply to shrubs and ornamental trees. Roses in very great variety succeed admirably. Many of the handsome flowering and ornamental trees and shrubs from the Brazils, East and West Indies, Mauritius, and Cape of Good Hope are thoroughly at home in the sub-tropics ; and gardens well stocked and tended can be made to show to as good if not to better advantage than in more temperate climes, for these shrubs keep up a display the year through. Where in Great Britain* and on the Continent there are conservatories, there are less costly but quite as attractive structures in Queensland called "bush" or shade houses. These are made in various styles, and generally of very inexpensive

materials, for simply creating permanent shade and thereby reducing the soil heat. In these many plants luxuriate which would not if exposed to the full glare of the summer sun, or if they had to resist the temperature the soil gets heated to in the open borders during that season. These structures are very frequently used as ferneries; and with taste and skill in arrangement it is quite surprising what an attraction they can become. Such conveniences are in common use by nurserymen all over the colony in propagating and growing plants for distribution, but of late years in Queensland they have become quite an institution and are already immensely popular. But there are many uses to which they may yet be applied as the industry of market-gardening extends, for many things which could not be raised profitably in the open borders can be grown to both satisfaction and profit under such altered and artificial circumstances.

TROPICAL PRODUCTS.

FRUITS.—Very much of Queensland's vast territory is fairly within the tropics, and the nearest idea British gardeners can have as to the capabilities of such a climate must come from experience in hothouses. The circumstances and surroundings which artifice creates to make the plant occupants of these structures in Britain are here naturally; and what costs so much trouble and labour to rear under these forcing conditions, are grown in Tropical Queensland in the open ground. Within the tropics, Queensland has about $12\frac{1}{2}$ degrees of territory. Northern or Tropical Queensland is not an unknown or untried country, still it is not so thickly settled, nor so extensively cultivated, as is the southern portion of the colony, although its capabilities in horticulture have already been pretty sharply and intelligently defined. The productions of temperate climes are not at home there. Many have tried them with any amount of patience and persistency, but the best results obtained only furnish success enough to declare them to be a most pronounced failure. There are some favoured spots where elevated table-land is found, as at Herberton, about the 17th parallel of south latitude, and in the western interior, farther south, where some of the productions of temperate climes do fairly well; still these are the exceptional cases, and not the rule; and it would be well for people settling in northern latitudes to make themselves familiar and contented with the plants indigenous to the tropics, and not waste their energies upon those of cooler latitudes. The fruits which promise to do well, so far as at present known, are the banana, pineapple, mango, bread-fruit, jack-fruit, orange, lemon, lime, citron, shaddock, cocoanut and date palms, durian, mangosteen, alligator or avocado pear, litchee, wampee, longan, persimmon, custard-apple, papaw, vee-apple—in short any that are common to the tropics. There are very extensive stretches of country near the coast within the tropics where the wild banana flourishes, and when the jungle and rich tropical vegetation is hewn down by the woodman to get it in readiness

for burning, a dense plantation of the wild banana springs up rapidly, completely hiding the mass of fallen timber, and making the clearing assume the appearance of a banana plantation. It stands to reason, therefore, that where the wild banana flourishes intending cultivators can have no difficulty with the better known varieties of that valuable and nutritious fruit. The sago and date palms would answer in localities where groves of indigenous palms now flourish within these latitudes, in such places mainly as are moist or where the roots can easily penetrate to water below. Along the sea-coast the cocoanut may be grown to any extent, and would furnish employment of a lucrative description to many families. Between the 17th and 19th parallels of south latitude there is a vast extent of hilly country clothed with tropical vegetation of all kinds, and having a fertile soil, and enjoying a heavy rainfall, which eventually must become the garden of Northern Queensland. The banana, ginger, pepper, nutmeg, and numerous other fruits and rich flowers are indigenous there, and the vegetation of the place generally is so rich and varied that it is a perfect paradise for the botanist and the lover of nature. The coffee and tea shrubs would grow in this extensive district to great perfection, and so also would vanilla, cinnamon, allspice, cloves, nutmegs, and other trees and spices of tropical value. As far south as Mackay on the Pioneer River, and only two degrees within the tropics, pines are sometimes grown from 12 lbs. to 30 lbs. weight; and even farther south than that, near Rockhampton, the smooth-leaved or Cayenne pine is often grown from 10 lbs. to 14 lbs. in weight, and bananas in great perfection. Mango-trees are also among the possibilities of these favoured lands in Northern Queensland latitudes; and a more luscious and enjoyable fruit in hot weather could hardly be desired.

VEGETABLES.—Dwellers in Northern Queensland seldom enjoy the luxury of a cabbage, a cauliflower, or a dish of green peas, unless they are imported by coasting steamers from the cooler South. The vegetables grown for use are mostly identical with Chinese and Indian productions. Several excellent beans are perennial, growing on for many years, and bearing profusely all the time. Instead of cabbage some leafy varieties of the silver beet, called "Chinese cabbage," is grown; instead of the old-country spinach there is an excellent and hardy Chinese variety of very rapid growth; instead of the English potato there is a never-failing tuberous-rooted convolvulus, called the sweet potato, which the majority of people readily learn to prefer to the old-country tuber. It is immensely prolific and good for everything. The young tops make excellent greens; and the tops altogether are highly relished as fodder by cows and pigs. The roots are cooked for table, but are simply cut up for horses and cows, and they are fed whole to pigs and fowls; they form the principal root crop of the tropics. Unlike the ordinary potato, they are propagated from cuttings, which start from the tuber, and it costs little or nothing to plant an acre, or even more, except the labour itself. An excellent flour, or what may be called arrowroot,

is made from the root, much in the same way as the latter article is prepared from the *Canna edulis*, or purple arrowroot. Then, besides these, the tropical North grows the yam, the South Sea Island taro, the large tubers of the tapioca (*Jatropha manihot*), and others; and in certain seasons of the year that American substitute for green peas—sweet corn—an early-maturing maize. During the cooler months of the year, by taking a few precautions, an occasional crop of English potatoes, small cabbages, French beans, carrots, beets, lettuces, and turnips can be grown. Very little has actually been done, still experiments carried to a successful issue prove the possibility of the thing, and further experimentation, conducted with intelligence and judgment, may show a still wider range of possibilities. Gardeners in the old country have acquired to a very great extent the art of forcing vegetables and fruits out of season, and the same scope for intelligence and contrivance exists in the midst of heat to grow the productions of cooler climes. Forcing will do it, but the forcing must be done by the refrigerator or in the shade house, and not by the hotbed or stove. At present the population settled in Northern Queensland is sparse, and no one finds it worth while to cater for the supply of vegetables; but let settlement increase, as it is now doing, and the time will come when vegetables will be as readily grown within the tropics as elsewhere.

FLOWERS AND SHRUBS.—Floriculture in the tropics will show more of the exotics found in stoves and hothouses in the old country than the plants common to the borders farther south or at home. Occasionally a few roses will be seen, but only a few of the many varieties grown elsewhere appear to be at all at home in the tropics. No one can as yet speak positively and say just what can and cannot be grown; but this much has been proved, that the favourites known as hybrid-perpetuals, and which embrace nearly all the best coloured and the most fragrant roses, are of little use for ornamentation in Northern Queensland. Only a few English annuals thrive there, and those are limited to such as love heat, and only suit for summer growth at home, and even then they thrive to greater perfection during winter than summer, within the tropics. Balsams, cockscombs, zinnias, portulacas, petunias, verbenas, geraniums, antirrhinums, phlox drummondii, and a few others do very well, and so also do many hot-house bulbs and herbaceous plants. Begonias, coleis, and a host of other ornamental foliage plants are well adapted to grace the borders and parterres; and for the shrubberies, an immense variety of ornamental shrubs and trees are suitable. The gaudy crotons from New Guinea occupy much the same place, in Northern gardens and shrubberies, that the laurel and the holly do at home. In the tropics, in the spring time, instead of the laburnum and the horse-chestnut, there is the gorgeous *Poinciana regia* with its brilliant display of scarlet bloom, and the *Jacaranda mimosæfolia* with its garment of cerulean hue, also the *lagerstrœmiæ*, in their many varieties of growth and colour; and shrubs and large trees

bloom profusely most of the summer through. Among smaller shrubs there are poincianas, poinsettias, hibiscuses, allamandas, hoyas, gardenias, Francisceas, many varieties of palms, conifers, and taxads; also a great variety of grotesque and huge cacti. Stove plants in Great Britain are more at home in the open borders in North Queensland than in the best kept, stove-heated winter garden in Europe. One of the great attractions of the North at the present time is the variety of orchids indigenous there; and in that climate their cultivation is of the simplest and easiest character imaginable. Orchid-houses, such as the bush-house already described, will ere long be a marked feature in all good collections in the North; and pretty nearly all the famous varieties grown could easily be accommodated there with all that is needful to make them vigorous and floriferous. The same remarks apply equally to ferns; and many choice varieties of this beautiful family of interesting and attractive plants may be easily grown there by the veriest tyro in horticulture.

CONCLUSION.

Such may be regarded as a brief digest of the capabilities of Queensland horticulture. It can be confidently asserted that horticulture will become as important an industry in Queensland as in any other country, and there is plenty of scope and opportunity for enterprise and capital to develop her immense resources in that direction.

HINTS TO IMMIGRANTS:

A Practical Essay

UPON

BUSH-LIFE IN QUEENSLAND.

BY

PRICE FLETCHER.

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HINTS TO IMMIGRANTS:

A PRACTICAL ESSAY

UPON

BUSH-LIFE IN QUEENSLAND.

BY PRICE FLETCHER.

AMONG our new arrivals there are always a certain number who have left the old country with the intention of getting a piece of land really their own, on which they can make a home for themselves—may be, get married, and settle down. I am happy to be able to tell them that in this fine colony they can, by patiently persevering, do that, and have no fear of landlord or tax-collector before their eyes; a state of happy content utterly beyond the possibility of an agricultural labourer in any European country whatever. In this paper I intend to try and give such hints as may, perhaps, be of use to those who are strangers to our climate, our woods, and method of cultivation. Also, I will try and show that any man who will keep sober, and be frugal and industrious, will, in the long run, be successful.

I will leave, for the present, immigrants who come out here with some capital and experience in farming at home, and will suppose you (the reader) are a young man who lands here without money or friends, but with good health and strength, and who are determined to succeed. Before entering on the practical part of my paper, I would just counsel you not to give way to the feeling of "home sickness," which you will doubtless experience. It will pass away as soon as you get to know a few folks, and after you have been here twelve months, instead of wishing, as you no doubt have done, "that you had never come to such a wretched country," you will find yourself thinking how you can get over your brother or sister, or, may be, the old folks also. At any rate, remember this: that if, after a fair trial, you find the colony not to your liking, you or any man can, in half-a-year, save enough money to take passage home again.

The first thing you should do is to hire on to some farm or station. Never mind about high wages for a beginning; take the first reasonable offer, and so make a start in your new life. After a time, if you find anything objectionable in your employer, why, this

is a free land, and you can leave him. But I would here give you a word of advice: do not be too proud to be found fault with—that is the great failing of most men who have been some years in the colonies. I do not counsel servileness, but only due forbearance, for you should remember that every employer likes to have his own way in his own affairs (it will be the same with you by-and-bye); and also remember that every one at times is found fault with, from even the manager to the labourer. Civility and sobriety go a great way with all masters, and cover a multitude of sins in the way of inefficiency or slowness, but they do not compensate for laziness; nothing puts a master's back up so much as that! I cannot too strongly inculcate the necessity for your learning every department of bush handicraft that you can possibly get the chance of learning. If your employer asks if you can do so-and-so, and you cannot, say you cannot; but say, also, that you doubtless soon could if he would show you how; and then try; and, however awkward it is, yet stick to it. Learn to milk, break in heifers, drive bullocks and horses, put up fences, sink wells, stock-ride, and slaughter; do your best to learn the use of tools, especially the axe, adze, saw, and maul and wedges. If you have hired to a squatter you can learn all this work on a station; and if it is a sheep station you can also learn to *shear*. I put great stress on this latter point, for whenever you come to select—having no capital but what you have saved—by being a good shearer you can every year earn, in three or four months, enough to keep your selection going for the rest of the year; so make it a point to ask your employer to let you be at work about the shearing shed; you will thus get an insight into the matter, and, at odd times, may have the chance of getting hold of a sheep which a shearer has already “opened up,” or begun; and so next year, when you ask your employer to let you learn to shear, it will not then be such awkward work. I really do not know a more awkward, and, at first, difficult work for a beginner than this shearing—especially to a long-backed man; but perseverance will do wonders. Keep steadily at it, work slowly, try and get a good style; never mind about making a big cheque the first season or two, but remember that in learning to shear you are actually learning a new trade, by which you can always earn a living in any Australian colony. After two seasons you will find yourself wondering how you could call it difficult; your shears will slip through easily, and you will earn money by it.

I may as well tell you now that, if you do as the majority of shearers and bushmen do when they get their cheques—that is, to go to the first public-house and “knock it down”—you will, like this “majority of bushmen,” ever remain a bushman, and never rise to be an employer;

so when you are paid put the money in the Savings Bank. It will be quite safe, for the Government guarantee it, and you will get 5 per cent. interest on it yearly. If there is no Savings Bank branch near you, then ask your employer to open an account in your name by letter; or, better still, do it yourself. All you have to do is to write to the Colonial Treasurer, Savings Bank Department, Brisbane, enclosing your cheque and your name, employment and address, and by return post the bank sends you an acknowledgment and a book. You can draw it out whenever you like, at any branch office, or by letter. Remember that it will only be by your saving every shilling that you will be able to acquire enough to select a piece of land.

The next accomplishment that will most likely come in useful to you as a selector is that of bullock-driving; though, unless you are a very young man, you are not likely ever to be able to acquire the skill and style of a colonial-born driver, still you may easily gain skill enough to be able to drive the home-station team, and so be able, when the time comes, to do your own driving when clearing and breaking up your selection. In fact, the selector who owns a team of bullocks and can drive them is in a better position than many of his neighbours who have capital. Another reason why I urge you to qualify yourself for this peculiarly colonial calling is, that a good bullock-driver can always, if steady, be certain of good wages; so that if things go wrong with you on your selection you still have (like the shearer) a trade to fall back upon, and also that, as your time need not be all taken up on your farm, if you have a team of bullocks you can for some months in the year do a little in carrying goods or wool for the neighbouring storekeeper or station, and so help to bring money enough in to keep your wife and little ones while the crops are growing. The same remarks apply to horse-driving; but to the new selector bullocks are by far the best.

There is another thing you must also do your best to learn, although it is not likely you will ever be able to take to it as a trade; I mean slaughtering. Learn to kill and dress quickly and neatly both sheep and cattle. In the old country you might live a lifetime and never require the knowledge, but in the colonies it is very different. You will have a chance during your two years of station life to get a good insight into this matter, and when you have your own home and your own cattle you will find this skill will be invaluable to you; also, you may then very likely have opportunities of selling some of your meat among your neighbours or to travellers, and so earn a little in that way; but badly-dressed and badly-cured meat no one will buy if he can help. The risk you run through this same badly-killed meat spoiling in this hot climate is also very great.

If you have been a farm labourer at home you will probably know how to milk; if you do not you must not lose any opportunity you may have of learning. It is an awkward and disagreeable thing for a beginner, and is best learned when young; but as you are looking forward to being yourself the owner of cows, the necessity for your learning does not need to be dwelt upon by me. If you are not a farm labourer, and do not know how to plough, sow, mow, or reap, you are not likely to be able to learn how to do those things on a squatting station; there is nothing of this sort goes on till the land is sold, such as is the case about the Darling Downs.

Although I speak of your remaining two years on a squatting station, you must not run away with the idea that you will have been able to have saved enough to enable you to select in that short time; it will take you from five to ten years of steady work—no extravagance, but on the contrary careful saving—before you will have money enough to venture with. But you need not lose heart; Queensland is very big, and good land is in superabundance. You will always be able to get land, so do not fret yourself and be in a hurry. I am supposing you to be a young man now: if by the time you are thirty-five you have managed to acquire a good bullock or horse team, dray, &c., and have a nice selection of some hundreds of acres, you will be in a better position than ninety-nine out of every one hundred persons you meet. Many of the large Queensland sheep farmers, with whom the getting of their wool to port is a difficulty, very often give to a sober industrious man a team of bullocks, and allow him to work it out by his contracting to carry for them a certain quantity of wool every year. This is a chance which it is quite possible for you to get; also, you may, by attention to your work, rise to be overseer, and so get double wages; or many other little chances may crop up, so that by the end of the time I mention your savings will be greater than you may suppose possible when you only look at the amount of your yearly wages.

If, after you have been about two years on a station, you see no likelihood of such chances as I have just mentioned ever cropping up, although you have gained the name of a good steady man, then I should advise you to travel and see a little more of the country. Travelling out here costs very little; all you want is an old horse and saddle, and then you can carry your blankets, &c. A very little money buys flour, meat, tea, and sugar, and you are as independent as a king, can go where and what distance you like, or camp at the nearest water and best grass. It is astonishing what information you pick up by even only seeing other districts and other ways of doing things. But I do not mean you to be an idle traveller; you should take a job of sheep washing here, shearing there, splitting, fencing, or any other work;

and also by all means then go into the farming districts and get work there, so as to learn the special modes of our farming, and somewhat of the seasons for putting in crops, &c. You must now seize the opportunity of learning to plough, sow, mow, reap, and to do other farm work. Even if you were a farm labourer at home, and knew how to do all these things, yet you will find that you have much to learn: farming is so different out here to what it is in the old country. After you have spent some time—say another two years—travelling and at odd jobs, and have got somewhat sick of it, I would then counsel you to settle down in the neighbourhood which you like best, or in which you are best known as a steady man and a good worker—say the station you first went to. You will now be no “new chum,” but will be able to earn a good living, for you will be up in many things; you can shear, or take station contracts for fencing, splitting, erecting huts, well-sinking, dam-making, &c. Although you may not get all this on the one place, you must remember that the fame of a good worker and steady man soon travels from station to station, and you would not be likely to find work slack.

You ought now to have a tidy little sum to your credit in the savings bank. As you only have interest allowed up to £200, I would advise you to always keep that amount there as a “nest egg,” and any surplus you may get you can invest in cattle, if you have won the confidence of your employer sufficiently to be allowed to let them graze on his run—or take payment in cattle instead of in cash, if you can. A large proportion of the now richest squatters of Victoria and New South Wales were at one time only shepherds and stockmen; but in the early days it was a very common usage for them to be paid their wages in stock, to which they stuck, and at the present time they are our wealthiest men.

Presuming that now you will be inclined to get a nice young wife and start housekeeping and farming on your own account, I will give such practical details from a long personal experience in the colonies, as I think may be useful to you; commencing with the way in which you will have to proceed in the selecting of your land.

In the former pages my “hints” were confined entirely to the case of a young man without capital, but many of our immigrants are possessed of considerable capital, and come with the intention of immediately settling on land; they, also, may perhaps find a little information in my papers. I would strongly counsel such men not to be in a hurry to choose their land; no matter whether their capital be only a few hundreds or up to a few thousands, it will be greatly to their advantage to delay, and learn something of the peculiarities of our strange climate. In the case of a man who has only a few hundreds, I should say to him, “Bank your money and take a situa-

tion"; and to the richer sort, if too proud to do this, then I should counsel a whole year's travelling, not only in a steamboat from port to port, but inland on horseback, from district to district, from station to farm. Join as a volunteer a travelling mob of cattle, stay some time on a sheep farm or station, visit the sugar-growing localities, and gather information from all sources; for, as sure as ever you invest without first thoroughly acquainting yourself with what you are going into, you will rue it—remember, it is cheaper to learn experience from another than at your own expense.

Queensland offers every range of situation and climate, so you can choose for yourself whether you will settle in the cool districts of our southern mountainous land, where European fruits and vegetables grow easily and to perfection, or whether you will go into our tropical north, where the more delicate but more luxuriant tropical productions thrive well. I will suppose, however, that you want to know something of how, where, and at what price, you can get land. I shall not enter too fully into all the minutiae of our Land Acts, but just give you such preliminary information as will enable you to know how to seek and get your selection.

First, as to where you can select. All Queensland is not open for anyone to go and pick out a piece of land, but from time to time large districts are proclaimed open, and you can take up your block anywhere in those districts; this proclamation is made in the *Government Gazette*, and is also fully made known by all the metropolitan and the local papers, so that there is no likelihood of your not knowing it. Then, if you go to the nearest land-office, you can get maps of the district, and also the officials will give you every information. You need not fear want of courtesy in any Queensland land-office.

Any person can select (whether newly arrived or not) who is eighteen years or more of age, whether man or woman, excepting married women. There are different classes of land you can select, namely:—(1.) Grazing Farms: Under the Act of 1884 you can take up land for this purpose, to the large quantity of 20,000 acres, but you cannot take less than 2,560 acres. The annual rent is fixed by the proclamation, but is never less than $\frac{3}{4}$ d. per acre. Your selection must be fenced in during the first three years, or a lease will not be granted. If the fencing conditions are fulfilled, however, a lease for 30 years will issue. (2.) Agricultural Farms may also be taken up in quantities varying from 320 acres to 1,280 acres. These must be fenced in during the first five years, and then a lease for 50 years will issue; or they may be purchased at the end of ten years, at £1 per acre, or more, as circumstances at the time of application may

suggest. There is one condition which you have to fulfil in respect of both classes of selections viz.:—Continuous and *bonâ fide* residence, either by yourself or by a bailiff in your employ—a copy of your agreement with your bailiff (if you do not personally reside) must be lodged and registered at the land-office. (3.) If you are willing to be contented with a small area of land which you mean to farm yourself, you can get it much more cheaply than in the previous cases by selecting what is called a “Homestead.” This is an agricultural farm, the area of which must not exceed 160 acres. If at any time before the end of seven years from the commencement of the time of the lease you prove to the Commissioner of Crown Lands that you have for five years continuously and honestly resided on the land *yourself* (no bailiff or substitute is here allowed), and that you have spent ten shillings per acre in substantial and permanent improvements, such as houses, fences, wells, clearings, gardens, cultivation, and so forth, then you can acquire the freehold at once by payment of a sum of money which when added to the rent already paid will amount to 2s. 6d. per acre, together with the ordinary deed fees. So that after five years the land is your own, if you have fulfilled the necessary conditions.

Your rent is due on the 31st of March in every year; if you do not pay it then you are allowed to let it run on for 90 days of the same year, but in that event you have also to pay a fine in some cases as high as 15 per cent. of the annual rent. If you do not pay before the expiration of 90 days, then you will forfeit the land and all improvements. If it can be proved against you that you have failed to fulfil the conditions of occupation or residence your lease will be forfeited.

I will suppose you have decided on what land you want to select; so I will tell you what next to do. Get two, or three, as the case may require, of the printed forms of “application”; these will be given you gratis on asking for them at any land-office, and you can also be there shown how to fill them up. On these applications you must put a clear description of the locality and boundaries of your selection, and also state if it is surveyed or not. These applications have to be signed and sworn before some magistrate; that is, you take oath that you are of the full age of eighteen years, that you select the land for your own use, and that you are entitled to select; then you lodge them at the land-office, and at the same time deposit one full year’s rent, together with the survey fee. The survey fee varies, according to the size of your block, from 12s. for one acre, and gradually diminishing *pro rata* till for 640 acres you only have to pay £8, and after that, for every 640 acres or fraction of 640 acres, you pay £4 additional.

On lodging your application you will be told when the land court will be held, and if you do not attend, in person or by your duly authorised attorney, the application will be rejected, and you will have a fine of 20s. deducted from your deposit money; the rest will be refunded. The Commissioner will declare in open court whether your application is accepted or not. The land agents give receipts for all moneys paid by applicants.

There are other clauses in the Act dealing with death, insolvency, transfers, mortgages, deeds of grant, &c., &c., but these do not come within my province to write about. I have mentioned all that is necessary for you, the newly-arrived farmer, to at present understand.

Never select land without first seeing it and judging its capabilities for yourself.

As to the locality you should choose for your home.—Even if you are a man without capital, if you have but experience in colonial ways (as fully spoken of previously), then you may venture to take up a small homestead; but you must be sure to take it in a locality where you can get work easily; *this is absolutely necessary for your success*, for you must remember that personal residence for the five years is imperative. If you have a wife and family, and they reside with you on it, you can of course be absent when at your work, and it does not mean that you cannot go away driving a dray, or shearing, or reaping, &c., but you must virtually reside—that is, *make it your home*.

It is as well for you to be reminded, before you take your selection, that, if your block adjoins any other person's selection, you will have to fence your half of the boundary fence between you within six months' time, if he gives you notice to that effect; or, if you do not do it, then he can fence it for you and charge you half of what it cost; so calculate your expenses before you select, and do not take too large a block, for fencing is very expensive. Many a selector has been crippled in pocket for years by this heavy outlay for fencing. If your neighbour is a rich man you may perhaps be able to make some such arrangement as for him to find the material and you the labour; but of course any such arrangement as that depends upon the nature of the country you have got, for there is far more labour in putting up a fence of split stuff than one of wire, so that what would be an equal agreement in one district would not be so in another. But I am supposing that you have made yourself sufficiently acquainted with colonial ways not to get the worst of a mutual agreement like the above.

I will say nothing about the *district* you should select in; *that* is a matter entirely for your own choice; but about the situation of your house I have a word or two to say. Very few selectors before coming here ever had the experience of choosing a site for a house or a farm homestead. In the old countries this is all done by landlord and builder; but so much of your future comfort, and also of your probable prosperity, depends upon this point that I intend to be explicit respecting it.

A point not to be lost sight of, more especially in a large holding, but also well worth taking into consideration by the holder of a small block, is, *to place the house and yards in as central a position as possible*. Even in a block of only 320 acres, if ever you come to cultivate and farm it properly, the saving of time in being in the middle of your paddocks is immense. You have not so far to cart your manure, and your cows do not take so long coming home. I was at one time of

my life a ploughman on a farm which was one mile long by half-a-mile broad, and the house was at one corner ; it was all arable ; many men were employed and several pairs of horses. The loss of time, not only by the men but also by the horses, coming and going, when we were cultivating the end fields, was then forcibly brought under my notice ; for we men took good care that the time expended in getting to and from work was not taken out of *our* time.

Now I have a grand caution to give you, which to the man of common sense may seem superfluous, but which the actual experience of colonial life shows to be constantly lost sight of or neglected. It is, do not be tempted under any circumstances whatever to *put up your house where there ever has been water over the ground* ; no matter how long it is since the flood was, it will come again some day, and the longer it delays the more woe to you ; even if you are the least doubtful if the flood-level has been as high as the spot you would like to put your house on, *don't put it there !* do not let the nearness to the water tempt you. It certainly is very nice to only have to slip down the hill to the waterhole with a couple of buckets and bring it up as wanted ; but the day will come when you will rue it. Go farther up the rising ground and put your house there. An immense amount of misery and ruin would have been saved to hundreds of Australian settlers if these points had only been heeded. Mind, I do not say you are not to select a piece of low-lying land over which the flood-waters have been ; that is a matter for speculation on your part, for the very best of our lands are often such, and the flooding wonderfully adds to their fertility ; I only say do not on any account whatever *put your house on such*. In the one case you only lose a crop and some money, in the latter case you *may* lose house, wife, children, stock, and home. I speak strongly on this point, for I have seen many Australian floods. The creek is dry to-day, and has been dry for a year perhaps—looks as if no amount of rain could ever make it run again—to-morrow no dry land is to be seen ! Our floods are rapid in their rising, uncertain as to time, and destructive in their effects.

So much for danger from water ; now for another point of risk also very often neglected. Before you begin to put up your house, *cut down every native tree* that can by any possibility fall on to the house. Do not be tempted by the handsome appearance of any tree, or by the idea of shade from it in the summer time, to build under its area of reach in case it fell down. This danger may not seem of much importance to you as you gaze on a fine big gum-tree in calm weather, but in windy weather, on stormy nights, its removal will save your wife, if not yourself, from many a sleepless anxious night ! Our Australian trees, as a general rule, are not calculated to stand alone when they have been all their lifetime accustomed to the shelter of the surrounding forest ; so the more you clear your farm the more does the danger increase from any isolated tree near your house. Again, although a tree may not fall in a gale, our trees are so many of them rotten at heart that huge branches are constantly snapping off. I

speak from experience on this subject as well as about the floods, for at one time I rented a farm on which my predecessor had put up the house, and there were several large trees left around it. Well, one day a gale came; I was working in the fields, but knowing how anxious my wife would be about those trees, I left off work and went home. Just as I got in sight of the house an extra blast of wind came, and I actually saw—the thought makes me shudder even now—the very tree I was most suspicious of (it was a gigantic gum) falling towards the house; it fell with a fearful crash, but, thank God! it was a little too short, and only the twigs and light top-branches touched the roof, but it broke to pieces the back door. Fortunately my wife had kept the children in, for if they had been (as they usually were) playing about the back yard, they would have been crushed. I know several similar cases; they are but too frequent; so—no matter what hurry you are in to put up your little house—*cut down the trees first*.

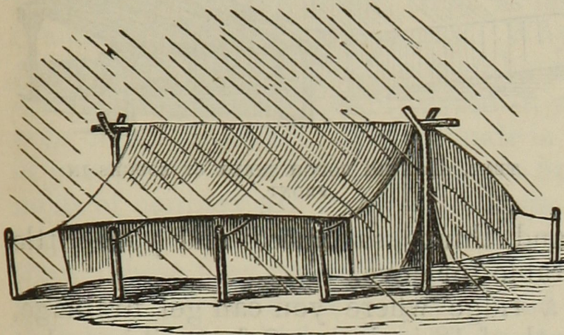
Another precaution I will also give you. If your land is in long-grassed country, then *burn or cut the grass* for some space around where you are going to put the house, or it *may* happen that a spark from your pipe, or a whirlwind among the ashes of your outside fire, may cause the grass to ignite, and, before you know it, all your slabs, shingles, or timber will be gone.

Choose a nice, dry, gravelly ridge, if you can get it, for the situation of the house and yards. Do not be tempted by the extra nearness of water to build on a mud or clay soil, if you can get a ridge or a sandhill; nearness to water is only of moment in the very first or incipient stage of selecting. As soon as you have got a horse and cart and can cart your water, it matters very little whether the waterhole is a quarter or half a mile off; the time and trouble is in the yoking up, the loading, and unloading, and not the actual distance the horse goes. The superior comfort to your wife, and through her to yourself, in a house built upon a nice dry ridge, over one built on a clay flat, is immense. Queensland clays are most tenacious, and stick to the boots in lumps as big as horses' heads; all this brought into a nice clean house is enough to spoil the temper of the most amiable woman. Of course I do not mean you to construe this advice into putting your house on such a rocky or barren spot that you cannot have a garden, for I believe in a garden around the house; but more about this directly.

TENT LIFE.

It may be that for some time you will have to live in a tent while your house is building and you are in a hurry to get your first crop in; especially is this likely to be the case if you have selected land in our interior, where timber is scarce and carriage of iron, etc., expensive. So a word or two on how to make your tent comfortable may, perhaps, be of use to some who very likely never lived in a tent before. Tents can be made very comfortable, and in our climate are quite sufficient protection from the weather if properly put up and lined. It is not the cold that is to be feared in a tent, but the extreme heat of a summer's day; the rain can be easily kept out, but on a hot day the interior of

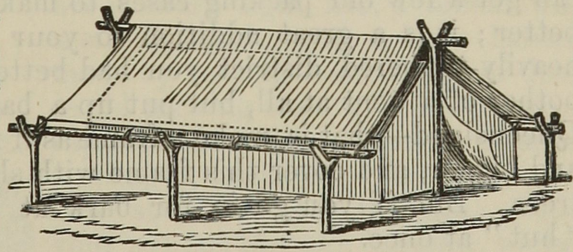
a tent is quite unbearable—hot as an oven—unless it is protected by a “fly” or false roof. This fly is an absolute necessity, not only for comfort but also for health; and if you have a wife and family whose work necessarily causes them to be much in the tent in the daytime, it is simply brutal not to put up a fly. It has many a time pained me sadly, when I have been travelling along a newly made section of railway, or at a “new rush,” to see the poor women suffering the purgatory of these flyless tents.



A TENT WITHOUT A FLY, AND IMPROPERLY PITCHED
WITH STAKES, IN A SQUALL.

goes everything; but a tent erected on a light frame of either round saplings or sawn battens is always strong and taut, and with a fly over is very comfortable. If you cannot get light sawn battens—2 in. by 2 in. or 3 in. by 2 in. or 3 in. by 1 in.—then light round saplings will do; these you must bark, also take off all knots, or the calico will soon work into a hole; make the frame just big enough to go *altogether* inside the tent. For the “fly,” put up at each end a stout fork well rammed into the ground and 1 foot taller than the tent. Across these place a second ridge pole; let this be stout and strong—it also must be barked and made smooth, or the constant flapping of the fly will quickly tear or wear it. Put the fly over the ridge and bring down the two ends; these are best fastened to a horizontal pole resting on two forks, exactly like a little ridge pole, placed 1 foot away from the sides of the tent; these poles need not be barked or smoothed, as only the cords of the fly are tied round them, but the forks must be very firmly put in the ground, for the fly has to stand the main strain of the wind.

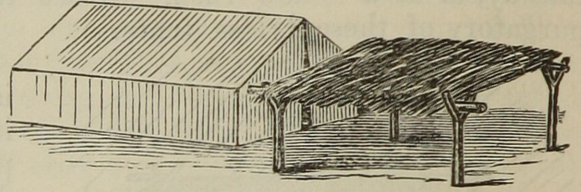
Unbleached calico is quite stout enough for a tent in this climate, and, with a fly of the same material over, is quite water and weather-proof. Another great comfort in tent life is a bough shade put up in front of the tent; this is often done but far oftener not done, and in the interest of suffering womankind in our hot climate I now mention it, so as to impress its necessity upon any new arrival or others who may read this. It is only a few hours' work; just cut six



FRAME TENT, WITH “FLY” COVERING.

or eight strong forks, some 8 feet long; put these firmly in the ground 2 feet deep, lay other spars across these forks, and place gum, tea-tree, oak, or any boughs with leaves, upon them, and you have a rough but cool verandah under which the women-folk can wash, cook, and do all the work, and under which you can sit, work, and take your meals, and so keep the tent clean for sleeping in.

All tents should have a gutter or little ditch cut round them on the outside, so as to catch the water that drips off the fly and also the storm water that comes down from the higher ground. Do not put this simple matter off till the rain comes, or you will be disgusted to find your provisions and things saturated and your little house made damp and uncomfortable for days.



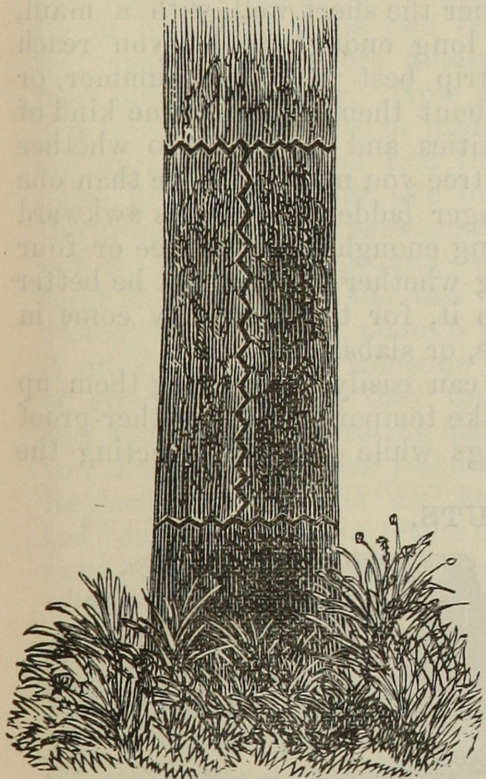
TENT, SHOWING ROUGH SHADE OF BOUGHS IN FRONT.

If your tent is situated on a ridge where you can get drainage, then excavate the floor to the depth of 18 inches or 2 feet; it is a plan not often adopted in Australia—why, I hardly know—but having lived in such a tent once, and found it a most comfortable arrangement, I strongly recommend it. One thing is necessary—to run a drain some 8 inches deep under the floor and out through the door, and so down the hill. If the land be level and this cannot be done, do not excavate at all, or you make a hole for the water to lodge in. After excavating, line with small stakes driven 6 inches into the ground and coming up just as high as the natural surface; this keeps the earth from falling into the tent every time the sides are touched. Now line the whole of the sides with blanketting, calico, osnaberg, or any old material, and your house will be very comfortable indeed. In a tent I lived in for many months, when on the Victorian diggings, the excavation was only in the middle; and the two sides, left the natural height of the surface, served my mate and myself as bunks to sleep on, and also as places for our boxes and things. Of course, we had a ditch on the outside as well as the inside drain, and the place was dry and cool. It was placed on the sides of one of the usual barren gravel ridges so common in gold districts. If you can get a few old packing cases to make a rough sort of floor all the better; it is a great addition to your comfort. If your land is in a heavily-timbered district you had better not go to the expense and bother of a tent at all, but put up a bark “humpy”—as we call it in Queensland—that is, make a frame as if for a tent, only taller, stronger, and bigger, and cover this frame with sheets of bark stripped from the trees. But if you go in for bark at all you may as well put up a “hut” at once.

As you are just from the old countries of Europe the idea of living in a bark house may seem strange, for such houses are, as far as my recollection goes, quite unknown there; but I can assure you that they are very comfortable, being warm in winter and cool in summer,

They are at best but ugly-looking things—it is impossible to put a finish on them—nevertheless, for a new selector, they are an admirable makeshift and will last for five or six years, or till you have funds enough to put up a permanent house.

It is a very great help to a selector to be located where he can get bark handy; the barn, stables, pig-pen, calf-pen, and all outhouses can with it be easily and quickly made, and the frightful expense of buying iron and weatherboards, or the labour of, or time employed in, splitting shingles avoided. Being from a land where thatched houses are common, you may perhaps say: Why not use the long Queensland grass for a roof? So I now take this opportunity to counsel you *never to*, if you can possibly avoid it, *put a thatched roof on* a house or even on an outhouse. This climate is very different to that of Europe: in our dry seasons the danger from bush fires is very great; scores of miles of country are burnt in a single day; the whole land around you may be invisible from the smoke of the burning grass, shrubs, and trees; these fires rage with fearful force and great rapidity, the sparks fly ahead for hundreds of yards, and a single one falling upon your thatched roof—which is now like tinder—will fire the whole homestead. If you are located in our far interior where there are no trees, then you must perforce use grass, but do not do so anywhere that you can possibly avoid it. This is no needless caution, for bush fires will be anxiety enough for your mind, without the extra anxiety that you may lose your home and all, as well.



METHOD OF CUTTING THE BARK BEFORE REMOVING THE SHEETS,

There are many of our trees off which you can strip large sound sheets of bark—namely, the black-butt, stringybark, box, messmate, &c. As these will all be new to you—if you are going to select without any preliminary colonial experience—you must get some neighbour to point out the different sorts. He may also be able to show you how to go about stripping, but, in case he is not, I will give you just a few hints. The tools you will require are a sharp light axe, a tomahawk, a strong spade, and a light ladder made by nailing some strips of deal—old packing case will do—on two saplings about 10 feet long. Choose a straight, healthy-looking tree, of a size about 4 feet through; with your axe cut through the bark, to the sapwood, a ring all round the tree about 3 feet from the ground; then mount your ladder, and, with the tomahawk, cut a similar girdle 6 feet

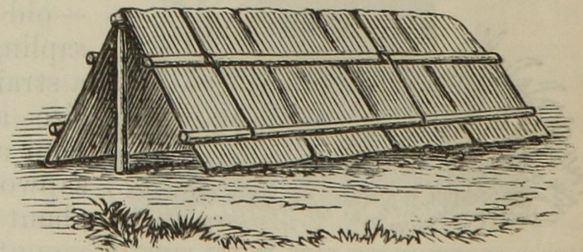
or 8 feet higher up, or the height that you wish your sheet to be long; next cut the bark through in a perpendicular line from the lower to the upper ring; a 3 feet wide sheet will be quite broad enough for you to experiment upon at first; so cut four of these upright lines—that is, divide the circumference of the tree into four parts—and you will get four sheets, each 3 feet by 8 feet out of the one girdle. You will find that you can cut through the fibres of our tough barks better by zig-zagging the cuts, like a herring-bone stitch, than by straight cuts. Now, with your axe start the edge of the bark the whole length of the upright cut; then insert your stout spade, the back of it next the bark, front next the wood; and by carefully working it you will find that—if the tree is in a fit state to strip at all—the bark will slip off easily. Use care so as not to make any cracks in the sheet, or you will spoil it for roofing purposes, although a sheet with a crack in does well enough for the walls of the house. If the tree is of less diameter than 4 feet you will find a considerable curve in the bark when taken off; do not put your foot upon it and crush it flat, or you will split it, but make a fire and put the sheet over it, inner side next the fire, and so steam it for a while; you will then be able to press it quite flat. Now take the spade and scrape off all the rough outside bark, until you have thinned the sheet considerably; put the four sheets one on the top of the other, and at once weight with two heavy logs, and leave till wanted.

If the bark does not slip off the tree easily, scrape the rough outside off with the spade, and then hammer the sheet well with a maul, without rings on, but with a handle long enough to let you reach to nearly the top of the cut. Trees strip best in spring, summer, or autumn; but there is no certainty about them, for the same kind of tree sometimes varies in different localities and according to whether it is a dry or a wet year. Off a tall tree you may get more than one length of bark, but you want a longer ladder; it also is awkward working so high up. If the tree is long enough to yield three or four lengths it is worth your while thinking whether it would not be better to cut the tree down and then strip it, for the tree may come in by-and-by for splitting into posts, rails, or slabs.

Having got a dozen sheets you can easily, by putting them up tent fashion against a ridge-pole, make temporary but weather-proof accommodation for yourself and things while you are erecting the hut.

BARK HUTS.

May be some of the readers of this will think it folly to dwell upon such an erection as a "bark" hut, but there are advantages connected with this simple kind of dwelling which greatly commend it to a new selector, and especially to a new-comer who has not yet

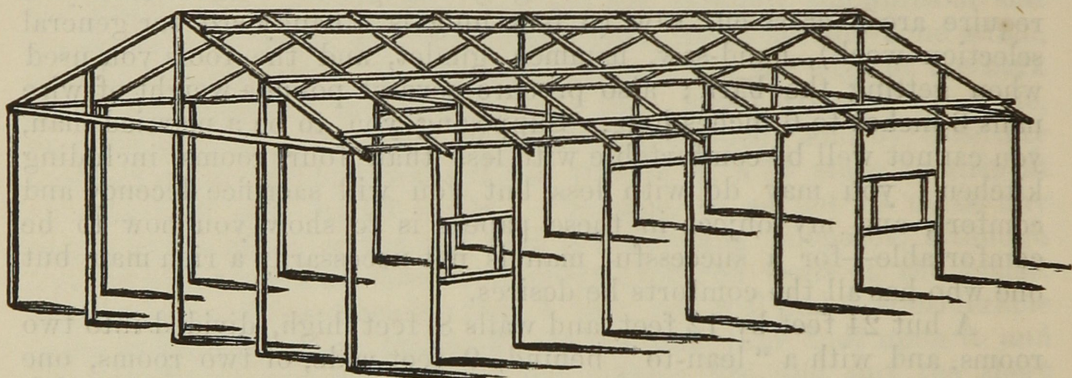


TEMPORARY BARK "HUMPY."

had any experience in bush handicraft. Even if you are a man who has no skill in the use of carpenters' tools you may venture to put up a bark hut, when, if you tried your hand at a slab hut, you would most surely get "bogged;" for a bark hut requires no adzing, squaring, splitting, or morticing, yet can be made strong and comfortable; it is, moreover, speedily erected, and, as I said above, is warm in winter, cool in summer, and thoroughly rain-proof. All the tools you require are a cross-cut saw (6 feet long is a handy size for general selection work), hand-saw, hammer, gimlet, and the tools you used when getting the bark; also procure several pounds weight of wire nails 3 inches to 6 inches long. Supposing you to be a married man, you cannot well be comfortable with less than four rooms, including kitchen; you may do with less, but you will sacrifice decency and comfort, and my object in these papers is to show you how to be comfortable—for a successful man is not necessarily a rich man, but one who has all the comforts he desires.

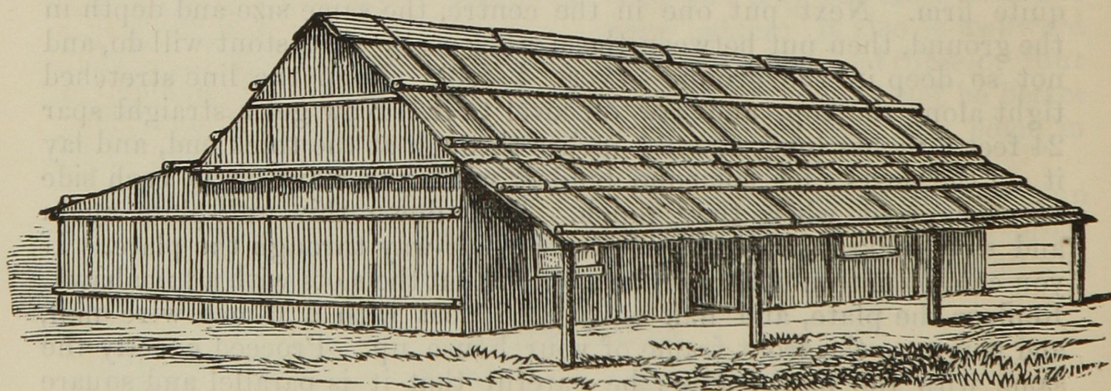
A hut 24 feet by 12 feet, and walls 8 feet high, divided into two rooms, and with a "lean-to" behind, 9 feet wide, of two rooms, one of which is the kitchen, will do very well, especially with a verandah in the front. All the timber you require for this can be round spars and saplings as got in the bush; they will need no trimming, except to take off the bark and branches; even if they are not particularly straight they will do, for, with bark, exactness is not looked for or necessary. Let your corner posts be 8 inches thick (big end) by 10 feet long; saw the top off level and put the posts 2 feet deep in the ground. Begin by putting the two front ones in at each corner—that is 24 feet apart; and before finally fixing stretch a cord across the top from one to the other. Now stand off some twenty yards and see if it is level; if not, raise or lower the posts till it is; see that the posts are upright, and then ram the earth all round them till they are quite firm. Next put one in the centre, the same size and depth in the ground, then put between these other posts—less stout will do, and not so deep in the ground—every 4 feet. Keep the line stretched tight along the top, and saw off level to it. Now get a straight spar 24 feet 6 inches long, about 6 inches through at the thick end, and lay it on the posts; let someone hold it while you mark on it each side of every post where they touch. Take down this wall-plate again and saw nicks, where the marks are, half-way through the plate. If you cannot use an adze you can now cut out the slots with a tomahawk. Replace the plate, and nail on to each post with a 6-inch wire nail, and you have the front frame of your house up. Proceed exactly the same with the back frame; be careful that it is parallel and square with the one already up. Next put a wall-plate across each and one across the middle; halve them into the front and back wall-plates, and nail firmly as well. Put a post in the middle of these ends and centre division wall, 2 feet deep in the ground, but let it be 13 feet out, or as high as you intend the ridge-pole to be. Where this touches the wall-plate, halve it into it—that is, take a piece, half way through, out of both post and wall-plate and nail together. Do the same with

the other end and with the middle division ; put a light spar along the top of these three uprights, and nail on as you did the wall-plates ; this is for a ridge-pole. Put other uprights every 4 feet apart in the end walls and division, and nail on. Now get some light spars, some 3-inch or 4-inch thick, and as long as to reach from wall-plate to ridge-pole—that will be about 8 feet long ; cut a little out where



FRAMEWORK FOR TWO-ROOMED BARK HUT.

they touch, and nail on. Put one every 3 feet on each side of the ridge ; these are your rafters. This roof will want staying, else a heavy gale of wind coming on to either end would cause it to yield lengthways ; so get two spars long enough to reach from the end of the ridge-pole to the centre of the division wall-plate ; nail in that position ; do the same with the opposite end. Now nail three light spars across the rafters—one near the top, one in the middle, and one near the bottom ; these are to hold the bark up. Nail similar battens all round the upright walls, except, of course, where you are going to have the windows and doors. All the posts being in the ground, there



BARK HUT, WITH VERANDAH AND LEAN-TO BEHIND.

ought to be no occasion for diagonal stays to them ; but if you think it needs them, then put some. The frame is now complete and ready for the bark ; so get a sheet, scrape off the rough outside, and put it on the roof. Try and get the sheets long enough to reach from ridge to wall-plate ; it makes a much neater job where there is no joining in the roof, and is better too, for the bark

can be pressed flatter. Give each sheet 1 foot overlap of its next neighbour on the roof; for the wall a lap of only a few inches will be sufficient. Over the ridge place the sheets lengthways, bending the sides down; but take great care you do not split them, for a split in the ridge will let in the wet sooner than any other place. Make a hole in the top end of each sheet that goes on the roof, fasten a strip of green hide or fencing wire to it, and as each sheet is handed up tie it to the top batten; this is not to hold the bark down, but just to stop it slipping from under the spars which keep the bark flat, hinder the sun from curling it up, or the wind blowing it off. To fix the spars on wire is the best—the old plan used to be by hanging spars pegged to the horizontal ones; but you should buy a hundred-weight or two of No. 8 good fencing-wire—you will find it always coming in useful for all sorts of things. Well, get a spar the length of the house and about 6 inches through, lay it upon the bark about 3 feet from the top, lay a similar spar on the opposite side of the ridge, and tie these two together, every 6 feet or so, by strands of wire; the wire being pliable will bend over the ridge, and so keep the sheet of bark that does duty for a ridge-cap always nicely curved. Now place another pair of similar spars about 1 foot from the eaves and suspend from the ones above, and your roof is fixed and firm; it will keep out wind and rain, heat and cold.

The sheets are best fixed on to the upright walls by placing, outside of the bark, light spars as battens exactly on a line with the battens on the inside, and binding these two together by means of wire, making a gimlet-hole for the wire to go through the bark; if the bark is thin you may nail the two battens together instead, and it makes a much neater job. For the two back rooms and the front verandah proceed in exactly the same way as you have done for the main building, but be sure that the roof-sheets of the “lean-to” go well under the upper ones. Six feet will be quite high enough for the uprights of the back wall, and the best plan of fixing the rafters is to nail the top end on to the corresponding rafter of the main building, about a foot and a-half from its end; this gives you considerably more slope for the roof of these back rooms.

FIREPLACES AND CHIMNEYS FOR BUSH HUTS.—Any new-comer will, after reading my previous remarks on bark huts, find no difficulty in erecting one; but I said nothing about a fireplace or chimney, and much comfort, not only to the wife but also to the master of the house, depends upon having a comfortable fireplace—one that will be large enough to allow a big fire to be made in it; one that will not make the wife cross, or injure her eyes by continually smoking, nor catch fire, and so burn down the hut some day when you are absent; one that will hold a large log, and so save the trouble of cutting the wood into small pieces (which is one of the greatest nuisances in the bush, and which, I am sorry to say, is too often left for the woman to do). While living in a tent you can do your cooking under a rough shelter made by placing forked uprights in the ground at the four corners of a 6-foot square—the two front ones about 6 feet high out of the

ground, the two back ones about 5 feet; across these lay two spars and one or two light battens, and cover with a couple of sheets of bark; around the back and two sides build a wall of loose stones or sods to about half-way up, and that is all that is required. Put a bough shade in front of this, and you have a very comfortable kitchen for fine or hot weather; in fact, you will find, if you put up a table under this shade, that you will prefer, during the hot weather, taking your meals under it to being under cover of a tent. It is astonishing how an expert bush cook will get through work with no better cooking-place than such a one as I have just described. I have known *one* man cook for fifty shearers, and cook well, too—for shearers are most exacting upon their cooks—with nothing but this bark “kitchen.” The utensils you will require for such a place are a camp-oven, iron pot, bucket, tin “billy,” fryingpan, tin plates and dishes, sheath knives, iron forks and spoons, pannikins, and an old spade. With this simple and cheap assortment your wife will, when she gets used to the camp-oven management and the colonial method of using hot ashes, turn out such a dinner as would, in the old country, be the envy of the parish.

But if you have a hut—even if it is only a bark one—I advise you to have the fireplace attached to it. Although Queensland is hot enough and to spare in summer, yet our winter months are biting cold; we do not have any snow and but seldom a strong frost, still the cold in this climate penetrates a person who has resided here a summer more than it does in England, and a fire in winter is very welcome indeed. Also, it is more comfortable for your wife to have the kitchen indoors, especially in case of sickness—and all through these pages you will find me *earnestly advocating the woman's comfort*; it is far too often overlooked by our new settlers. Leave a 5-foot wide gap in the back wall of one of the back rooms of the hut; this is not a bit too wide for a good bush fireplace, and we will have it 5 feet deep also—that is, a square of 5 feet. At the two outside corners erect upright tapering spars 6 inches thick at the butt end, and let these be a *little higher out of the ground than the ridge of the roof*; put them 2 feet deep in the ground; put also a similar spar between each of these and the house, but let it be only 18 inches from the corner upright. These four will form the shaft of the chimney, and it will be 5 feet by 18 inches in size. See that these are all quite upright, then join all together by several crosspieces nailed on to the outsides; also join to the house by a crosspiece near the ground, and one 5 feet up as well; do the same on the other side. Now get a sheet of thin (not corrugated) iron, 6 feet long and 2 feet 6 inches wide; double this lengthways into a V shape, but let the one leg of the V be 2 feet wide and the other 6 inches. Nail the short flap—keeping the bent side down—to the outside of the wall of the house, over the gap left for the fireplace, and the height up that you want the mantelshelf to be—that is, about 5 feet from the floor. Nail one end of a light spar to the upright of the hut just under this sheet of iron, and take the other end to the outside one of the chimney spars, letting it touch it at about 4 feet

from the top; halve it into both uprights, and nail; do the same to the opposite side. These act as stays to the shaft, and also contract the opening. Now fasten down the long or 2 feet flap of the sheet of iron to these two stays, and you have a gutter formed between the chimney and the house which *will never let in the rain* however much it pours down. You can now nail or fasten on the bark, placing battens across according to the size of the sheets, just as you did for the hut. Let the sheets covering the sloping or roof part of the chimney come well over the edge of the sheet of iron. It would be better to place another sheet of iron, or some old sheets of tin cases, underneath these sloping sheets of bark; it would then not matter how big a blaze there chanced to be in the fire, for there are *no beams or anything overhead* which could catch fire. The usual way of building a bush chimney is to contract the shaft from all sides but the back to a diameter of from 1 foot to 2 feet, but this would be far more difficult for you—whom I am supposing to have as yet but little skill with tools—to do. Also the cross-beams necessary frequently get on fire after they become old and dry; and, besides, my experience is that these contracted narrow-necked chimneys *often smoke*, whereas the simply-built one I advocate will not. A little rain may come down my wide flue, but as it all falls at the very back of the fireplace, it does no harm. I am writing this before a fine fire made in a fireplace like this, and, although 18 inches rain fell in two days of last week, we never had any trouble with the fire. You will have to line the inside of the fireplace with sheets of old tin or iron, to the height of 4 feet, or, if you cannot get this, then you must build a rough wall of stones and mortar all round the inside. You have only one thing more to do to make sure that your chimney will not smoke—that is, *raise the floor of the fireplace* to quite 1 foot higher than the floor of the hut. This is a wrinkle not generally known. It alone will often, but not always, cure the smoking of bush fireplaces, even with the most contracted of chimneys. But with a straight flue such as I have just described, a raised floor, the chimney shaft as high as the ridge, and no cracks in it, you *will never be troubled with smoke*, no matter how hard or what direction the wind blows.

TREE-FALLING AND TOOLS.

I spoke previously of bark huts; you may very likely, however, be able to afford the expense and time of erecting a substantial *slab hut* at once, but, before you can do this, it is necessary you should know something of tree-falling and the tools you will want. Nothing but practical experience will teach you this properly, and if you can afford to hire a good bush carpenter *it is your best and quickest mode of learning*; but in order that you may not be completely under his "tyranny" (for the old hands know well how to "come the boss" over a new-comer) I will give you a few hints; very likely, too, you may not be able to afford to pay for labour, but prefer building your hut yourself, room by room, as you get the opportunity.

The tools you will want are—an *American axe*, not too heavy—as you are not used to an axe, rather err on the side of lightness; a *cross-cut saw* 6 feet long. One of the most useful tools you can buy is the “*one-man American cross-cut saw*”—it is about 4 feet 6 inches long, and, as the name implies, can be worked by one man; I can vouch from my own experience for its being the most handy and useful saw for any selector. As I do not suppose you will at first be inclined to tackle a very big tree, this one-man tool will do instead of the 6 feet double cross-cut, but see that it has a loop at the end for fixing another handle; it can then be worked by two men if required, and will serve for trees not more than 3 feet through. Directions for sharpening these American saws are printed on the saw itself; read these carefully, and copy them out before they get rusted off. Buy several files suitable to the saw, and also a common saw-set. A thoughtful man, after reading these plain directions, will find no great difficulty in sharpening his saw; it only wants care and thought. This saw-sharpening is one of the things which out in these colonies you, the master farmer, *must* learn to do; if you do not—as you cannot get the tool into town to get done every time it wants it, and as many of the old bush hands who say they can sharpen a saw know nothing of the principle of it, but will spoil your nice thin Yankee blade the first time they try—your arms will be almost pulled off dragging the blunt unset tool backwards and forwards, and yet do no good; so my advice is, learn to sharpen and set it yourself, and *never* let any of your men do it. You must also buy a *grindstone*; it is a thing you cannot do without; however short of cash you may be, it is no good going into the bush without one. If you have money buy a set of anti-friction rollers and an iron axle and handle; they make the work much easier; but a good makeshift can be made with a bent wooden axle, obtained from some curved branch of a tree. Having got the stone, erect it the very first job, and always keep your axe sharp by giving it a light touch every morning before you go to work; it will then never want much grinding, unless you are so careless as to chip a gap in it by striking against the wedges when splitting a log; if you do you must grind the gap out before you can again use it with proper effect. Do not grind the edge only or you will make the axe too stunted, but grind a little off the cheeks every time as well; aim to preserve the fine gradual wedge shape it had when you bought it.

You will also want a *set of wedges*—six will do—some small and thin for entering—that is, beginning to split the log—and some longer and stouter; the largest may be 10 inches long by $2\frac{1}{2}$ inches broad, and 2 inches thick at the head; do not have the bottom edge hammered too thin by the smith, but use the grindstone to it instead; by this method they are not so apt to turn or twist when they come against a knot. Before beginning work you will want a “*maul*,” as it is called in the colonies—“*beetle*” I have heard it called in England; that is, get a piece of hard tough wood, 9 inches long and 6 inches through, pare the two ends down to a thickness of 5 inches, or whatever size your maul-rings are—a handy size for these is 5 inches diameter, $1\frac{1}{4}$

inch broad, and $\frac{1}{2}$ inch thick ; but every man hash is own fancy about the size and weight of a maul. Slip these tightly one over each end, and let the wood project $\frac{3}{4}$ inch. Now bore a 1-inch hole perfectly true through the centre between the two rings, and insert a round, smooth, tough handle, about 2 feet 8 inches or 2 feet 10 inches long ; drive a wedge into the end that goes through the maul, and if properly done it will not come off even with the excessive hammering it will have to do. But I am telling you to bore a hole, and yet have not told you what to do it with ; you must buy three augers— $\frac{3}{4}$ -inch, 1-inch, and $1\frac{1}{2}$ -inch (you will want all these when building your hut) ; get the sort called “ *shell* ” augers, for as sure as ever you, unaccustomed to boring, begin to work with the ordinary bush auger you will snap off the worm screw and the thing is then useless ; besides, the shell sort never choke up (I have never tried them in very hard dry wood), and one of the commonest and most irritating nuisances to the bush worker is this choking of augers. I always use “ Gilpin’s patent ” ; these, if kept quite clean and sharp, work well, but not otherwise. To start the hole for a shell auger, take out half an inch or so with a gouge or round chisel.

I now suppose you are anxious to set to work to knock down your maiden tree. The love of destruction being so inherent in mankind, you will find that you will always experience a pleasure—as if of overcoming a difficulty—of conscious power, when you see a gigantic gum-tree falling, the result of the repeated strokes of your own sharp axe. Do not stand, and look, and think how big the tree is, and that you can never get it down, and that you had better look for a smaller one ; if it is straight, and therefore likely to split easily, then set to work at it ; it will soon come down, and the bigger it is the more slabs or posts you will get.

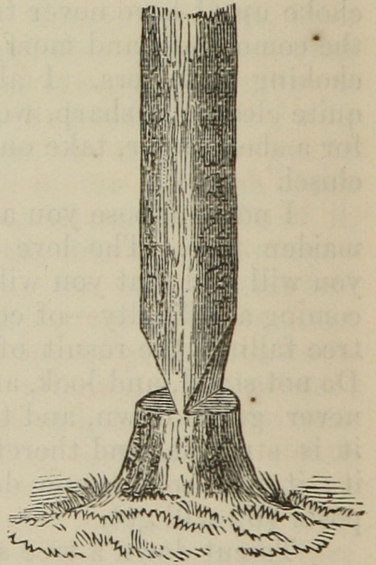
To cut down a tree seems a very simple thing to do, and no new-comer would admit that he could not do it. I have several times taken a freshly-arrived immigrant at his word and set him to work at a tree, and it is invariably the case that, although he will get the tree down it is with a greater expenditure of strength than is necessary, and also with considerable danger to himself.

The accompanying sketch will show you better than any description how to go about it. However, I will explain it somewhat. Do not chop all round the tree till you get it standing like a peg-top on its point ; that is what all new-comers (if they have never done any wood-cutting before—as few have) invariably do, and therein lies the danger to themselves, for if the tree is upright, without any decided lean, it is impossible to say which way it will fall ; a puff of wind, or an extra preponderance of branches on one side, may slew it quite round upon the top of you. Choose the tree you want ; notice which side it leans to ; then, on the *underneath* or *leaning side*, proceed to chop out a gap, as shown in the picture ; keep the bottom of the chop level, by using the axe horizontally or across the cut, but make the cut with a slope by using the axe from above downwards ; when this is properly carried out the butt of the fallen tree will be wedge-shaped, but the

top of the stump will be almost as level as if sawn across ; not that it matters as far as appearance goes, whether the old stump is level or uneven, but by making it level there is, when you get used to the work, no unnecessary chopping. The main thing to tell you about this is, to *make the chop or gap wide enough*, so as to give plenty of room for your axe to work when you are getting near the middle of the tree ; for which reason the thicker the tree the wider must this chop be. Nothing is more common than to see a new hand, who thinks he is saving himself trouble by only taking out a narrow chop, get hopelessly "bogged" and distressed, as, finding his axe will not bite, he uses more and more unnecessary strength, the only result being a blunting of the axe, and maledictions uttered against the Australian trees.

Having cut the tree half or nearly half-way through, next proceed to the other or upper side ; do the same there, and, when you get sufficiently far through, the tree will fall harmlessly over in the direction of the first cut, and away from yourself. When the tree begins to crack and show signs of falling *do not be so foolish as to run away* ; for if it *should* happen to fall the way you ran the top branches would most assuredly catch you before you could get out of their reach, and you would be killed ; but stand by the trunk, a few feet away, coolly watch which way it is going over, then quietly walk a few more feet away from it.

It may be that you have got a tree so upright that you cannot judge which way it will fall ; in such case, if there is any wind blowing, treat the lee side as the leaning side. You will now see that by cutting the chop on the butt of the tree wedge or $\triangleright$ shaped, it can only fall *two* ways, whereas if you cut it peg-top fashion it may *twist round on itself and fall any way* ; so do not be tempted, when the bottom of the tree is assuming the shape of a thin wedge, to chop in from the side, thinking that you can thereby hasten its falling. If the tree is large, but short in the barrel, and has a top of heavy strong branches, these branches may, by touching the ground first on falling, cause the butt to "kick up," and perhaps fall down again alongside the stump, exactly where you were standing when you gave the last chop ; therefore do not remain close to the stump when once you *see for certain* that the tree is going. There is another cause of kicking, the result of careless cutting of the under-cut, that is far more dangerous ; I will try and point it out to you. If the tree is leaning over considerably, then it is somewhat difficult to work the underneath cut, and you, perhaps, think "Oh, it is certain to fall that way," so you start on the upper side without bothering with an under-cut. Well, when you have got half-way



THE PROPER WAY TO CUT THE
TREE WHEN FALLING IT
WITH AN AXE.

through, the tree falls, the *trunk splits up* for many feet, the butt is hoisted high in the air, and, through using the uncut half as a fulcrum or purchase, is actually forced backwards a considerable distance behind the stump as it falls to the ground. This is more likely to occur when you use a cross-cut saw to fall with, instead of an axe, for the saw gets pinched by the pressure of the leaning tree before you have got the cut far enough towards the centre; in such a case even upright trees will split up and so be useless as timber, beside being dangerous to the faller. If you prefer to use the cross-cut saw, do so only on the upper side, using the axe for the under or leaning side, until you have gained some experience in wood-craft. Before commencing work cast a look up to the top and notice whether any of the branches are inlocked with a neighbouring tree, or are rotten, and so likely to break off and fall where you are standing as the tree goes over; it is astonishing what a severe hit even only a small branch will give when it falls from a good height.

If the tree in falling catches in another, and remains so suspended, *do not bother any more with it*, for to cut the tree down that supports it requires a man far more experienced in axe-work than you will be for some time. It is always a dangerous operation; better sacrifice the time you have spent upon it than risk your life *for the sake of a few slabs*.

To teach axe-craft by writing only is impossible, but the above hints may help you somewhat; however, set boldly to work and you will soon find out a "thousand and one" little wrinkles which cannot be written about. The best practical advice I can give you is: If you can afford it, hire a good old-fashioned "bush-carpenter" for a few weeks; you will then see how things are done.

SPLITTING SHINGLES.

Being fresh from a land where slates, tiles, and thatch are the principal materials used for roofing purposes, it is very likely you do not even know what a "shingle" is. Well, then, look up at the older houses in Brisbane, and you will see that they are roofed with narrow strips of wood, laid, slate fashion, one over the other. That is a "shingle" roof, and, as it is an exceedingly comfortable and durable one, I purpose now giving you some directions upon the method of splitting them, so that you can roof your slab house with something more sightly than bark. Another reason I have is, that if you are located anywhere near a new township, you may there get a considerable sale for shingles; even if you have not the timber on your own selection you can, by paying a fee of £2 a year to the nearest clerk of petty sessions, get a license to go on any Crown lands and cut what timber you want, not only for your own use but also for sale; if you cut pine or soft wood, then the license-fee is £4. Very likely the "bush carpenter" you may have hired to help you with the hut may know nothing about splitting shingles, for since the introduction of galvanised iron they are not so much in demand as they were in the early days. Still, for a bush house, in which the roof is

necessarily low down, as compared with town houses, shingles are by far the best (because cooler) roof for our hot climate. They have the disadvantage of requiring more rafters than iron or bark, for they are a great weight, and also they require a large number of sawn battens or light spars, adzed quite smooth or level, on which they rest and are nailed.

The best shingles are the *narrowest*; from $2\frac{3}{4}$ inches to $4\frac{1}{2}$ inches is, in my experience, the best width. I have seen them 6 inches wide, and these stand the weather well, but more often these wide ones will *crack* or curl up; so do not go beyond the $4\frac{1}{2}$ inch, for there is no occasion for you to run the risk of a leaky roof. In length make them 15 inches or 18 inches, and the thickness $\frac{3}{8}$ inch to $\frac{1}{2}$ inch. Do not strive how thin you can split them, if you have got hold of a very easy splitting tree; the thick ones are the best for they do not crack. One thing is absolutely necessary: *they must be straight and flat*—no curve or twist of any sort in them. For splitting slabs or shingles, posts or rails, it is essential that you should choose a tree that *will* split. To tell you by writing what tree will split is impossible; it is an art only learned by experience, but a few hints may help you in acquiring that experience. Fix on a tree whose bark runs in a grain quite straight up and down, for as is the grain of the bark so runs the grain of the wood, although it is not always the case that a tree with straight running bark will split. To help you further, knock off some bark and chip out a piece of the wood from the butt, some 8 inches square and to a depth of some 3 inches, and notice whether it is “free”—that is, if it parts easily; but the degree of freeness necessary you can only learn to judge of by trial. If the bark is curly—that is, if the grain runs in waves from side to side—you can knock the tree down if you like and try it, but you will never again knock a curly one down, for you will have found out that the wood is just as curly as the bark, and each fibre tightly inlocked with its neighbour, and so quite impossible to split. Any of our hardwoods that will split will do well for shingles, provided they are not made too thin.*

The bigger the tree the better for shingle-splitting, so choose one not less than 4 feet through; if it is “pipey”—that is hollow all up the centre—it does not matter; it is just as good, if not better, than the sound tree, for you must not make use of the very heart.

After the tree has fallen, knock off the bark, saw off the wedge-shaped butt-end and then

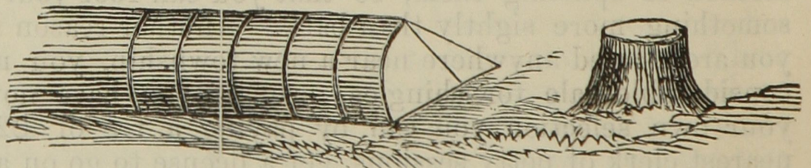


FIG. 1—FALLEN TREE, SHOWING HOW TO CUT INTO SECTIONS FOR SHINGLES.

saw the rest of the log up into cuts exactly the breadth you intend the shingles to be *long* (fig. 1). Now turn one of these sections face up on the ground, and with a carpenter's pencil mark it as I am about to

* The best wood for shingles is spotted-gum, as it does not colour the water.—Ed.

tell you. We will suppose the tree is 4 feet across; then all around the edge mark off every $4\frac{1}{2}$ inches—the width you do not intend the shingles to exceed. A very good rough guide for these $4\frac{1}{2}$ -inch marks is the breadth of your hand as laid flat on the edge of the block. Having marked all round (in a tree 4 feet through there will be thirty-two of these marks), take a straight-edged bit of deal and draw a line from any one of these outside marks (see A fig. 2) to the centre of the stump; now draw a similar line from the adjoining mark (C) again to the centre. As you do not want the shingles to be a less width than $2\frac{3}{4}$ inches, have a piece of wood just that length, and with it measure and mark where the lines are *exactly that width apart*; it will be about D. Next, with a pencil fastened to a bit of string and the other end of the string fastened to a nail driven into the centre of the block, draw the circle D, E, F, D, and mark it off into $2\frac{3}{4}$ -inch spaces, just as you did the outside rim into $4\frac{1}{2}$ inches; then draw lines from every outside mark to its corresponding inside one, as shown at K H, and you have all your “billets” nicely and exactly marked. All this may sound rather puzzling, but try it on the stump and it will in reality be found quite simple; once mastered you will find it very easy, and by it you will avoid any waste wood or irregular shingles, and you *cannot possibly make them either too broad or too narrow*. If the heart of the tree is sound you can get an inner layer of billets by treating the inner circle, D, E, F, D exactly the same as you did the outer one, but there is bound to be a centre piece of the very heart which it will be useless to split up. If the tree is “pipey” you can find the centre point and draw the circle all the same, by placing across the pipe a piece of old deal case. Now with your wedges and maul split this block in half, then into half again—that is into quarters—and again into half-quarters, but always keeping on to one of the lines. Now split off the inner circle of billets; you can then divide the outside into the divisions as marked, and you have the whole cut of the tree split up into pieces the shape of fig. 3, and ready to be

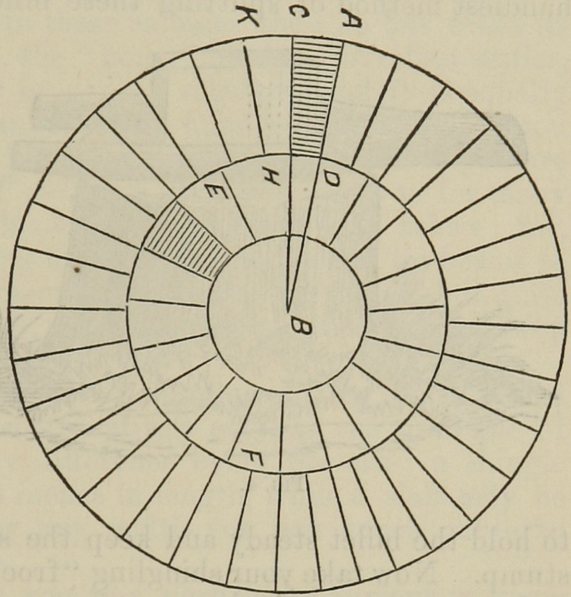


FIG. 2.—A BLOCK 4 FEET ACROSS MARKED FOR SPLITTING INTO “BILLETS.”

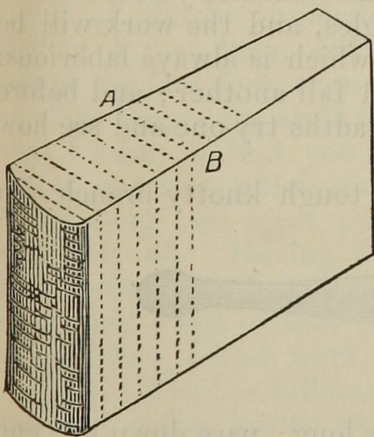


FIG. 3.

you did the outer one, but there is bound to be a centre piece of the very heart which it will be useless to split up. If the tree is “pipey” you can find the centre point and draw the circle all the same, by placing across the pipe a piece of old deal case. Now with your wedges and maul split this block in half, then into half again—that is into quarters—and again into half-quarters, but always keeping on to one of the lines. Now split off the inner circle of billets; you can then divide the outside into the divisions as marked, and you have the whole cut of the tree split up into pieces the shape of fig. 3, and ready to be

further split into shingles. Each billet will be 18 inches tall by $4\frac{1}{2}$ inches broad at the one end, and $2\frac{3}{4}$ inches at the thin end, and about 1 foot long, and will yield you, if the wood is all good, 24 shingles, or 768 in all, not counting the inner circle of billets, which should yield about 240, or 1,000 in the one cut of the tree. The quickest and handiest method of splitting these billets into shingles is this: Get a

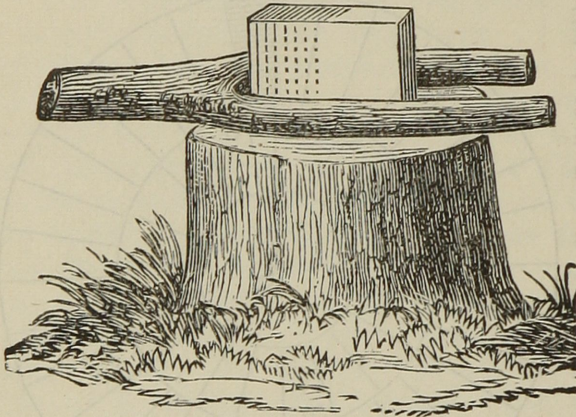


FIG. 4.

fork of a tree 6 feet or 7 feet long, and the thickness of your thigh; place this flat across the stump of the fallen tree, the two prongs projecting 1 foot or so over to the right of the stump, and the butt end projecting a similar distance over the left, as you look at it. Notice that it rests firmly and is solid; lift up one of the "billets" and put it, end upwards, between the forks (as shown in fig. 4); the business of the fork is simply

to hold the billet steady and keep the split pieces from falling on the stump. Now take your shingling "froe" (fig. 5)—a tool you must buy and can get at any bush store—in your left hand, and your mallet (fig. 6) in your right, lay the "froe" on the centre of the billet in the line A B (fig. 3), give it a smart hit with the mallet, and the billet falls in two. Divide the halves again, and again, and again, but always in the same direction as the first cut (see dotted lines, fig. 3) till each bit will just split into two shingles; a good gauge of the proper thickness of these is the breadth of the back edge of the "froe"; do *not* knock each shingle off by itself, but *halve, and halve each half*, as stated above.

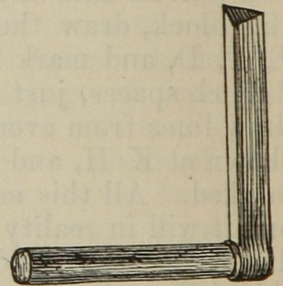


FIG. 5.

By proceeding in this simple yet systematic manner you will waste but little wood, have but few inferior shingles, and the work will be a pleasure to you, except the sawing part, which is always laborious. If the tree does not split easily, leave it and fall another; and before you go to the bother of sawing off all the breadths try one and see how it will split.

The mallet (fig. 6) is simply a piece of tough knotty branch of a

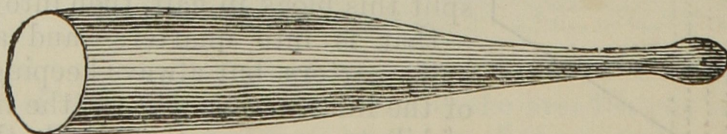


FIG. 6.

tree, about 4 inches thick and about 1 foot long; pare down one end till it is thin enough for your hand to grasp, and you use it as you

would a club if you were going to knock down an enemy. Always, when not using the mallet, lay it down on the forks *to your right*, and lay the "fro" down on the *left*; they are thus always to hand.

SLAB HUTS.

In the early days of settlement in America the *log* cabin was almost the universal dwelling; in these colonies the slab hut takes its place; it is *the* hut of the bush, the "home" of the Australian settler, whether he be a rich squatter or a poor selector; and it is equally applicable to both, for on it can be spent hundreds of pounds if you want to be grand, or it can be put up for *less than a score*, if you are pinched for money or time. If *well* put up it will last you for many years, but if "slummed" it will soon get shaky and lean askew; for, having no diagonal stays, nothing but the wall-plates and tie-beams to hold it together (as the slabs themselves, not being nailed, but quite loose, give no additional stiffness), unless the corner posts are put deep in the ground it is the weakest of structures.

If you have mastered the details of shingle-splitting, you will find splitting the slabs for the hut comparatively easy, as the principle of the matter is the same, the only difference being the size; a shingle seldom measuring more than 18 inches in length, while a slab may be 6 feet, 7 feet, or 8 feet long, by any width you can knock out—the wider the better.

Before cutting down a tree you may perhaps be anxious to know how tall it is. In simple short work, like slab-splitting, you can guess pretty well how many lengths you can get out of a trunk, but as at some time or other of your bush life you may perhaps be able to obtain a contract to get telegraph poles, long beams, or piles for bridge-building, I will give you an easy plan by which you can tell the height of any tree whose shadow you can measure; it is more often only the height to the first fork or branch that you will require. Set up a stick 6 feet long, and when its shadow is equal to it—that is, when it is 6 feet—measure the length of the shadow of the tree, and *that will be the tree's height*. Or, if you do not choose to wait till the shadow is equal to the height of the stick, you can find it any time by a rule of simple proportion; thus, if a stick 6 feet tall throws a shadow 4 feet long, and a neighbouring tree throws a shadow 40 feet to the first fork, then the height to that fork will be 60 feet.

The longer the slabs the more "free" you require the tree to be: what I mean is, that you can knock 3 feet and 4 feet slabs out of almost any tree which is not decidedly curly, but for slabs 7 feet or 8 feet long you must pick the best splitting tree your judgment tells you of. Having felled the tree, mark off the lengths you want—whether 4 feet, 5 feet, 6 feet, or 8 feet—and, before beginning to saw, cut a rim of bark off from the track the saw will take, for the bark hinders it from working freely.

If the tree has fallen so that it rests upon its butt and one of its branches, and so has no support in the middle of the trunk, and you begin to saw off the cut, you will find that before you have got half-

way through the saw will be so pinched by the log closing up that you will be unable to move it one way or the other, and you will even be puzzled how to get it out again. What you must do to avoid this is, before commencing the cut, to prop up the centre with a stout chock

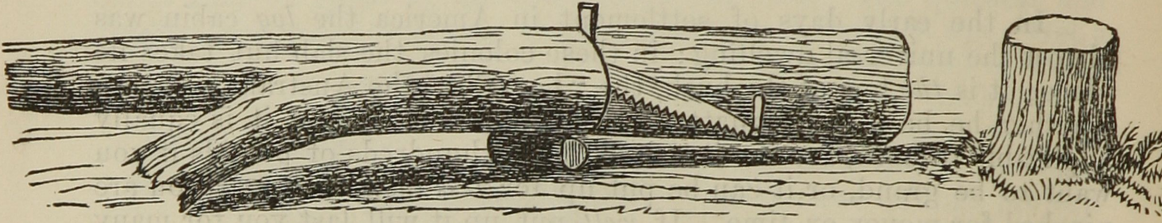


FIG. 7.

of wood, so as to take the weight off one end, and, as the saw gets buried, drive in a wedge over it on the top of the cut. The drawing (fig. 7) will show you what I mean.

The next thing to do after sawing off the block is to "open it up"—that is, to split it into two equal halves; to do this, start the crack at one end (the top end is the best) by inserting two or three of

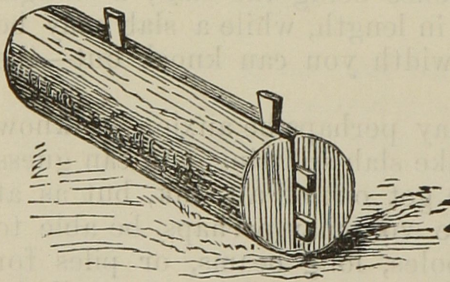


FIG. 8.

the smallest wedges, driving them in equally and a little at a time, and, as the crack opens, drive in the other and larger wedges along the top (see drawing, fig 8). In addition to the iron wedges you want two or three large wooden ones, which you can shape for yourself out of a piece of hardwood; make them 18 inches or 2 feet long and some 5 inches or 6 inches

thick at the butt. After starting the crack with the iron wedges, doubling them where required—that is, driving a fresh one in alongside one that is already driven "home"—insert the big wooden ones, drive them "home," and the log will fall in two. Some logs will want rolling over and working from the opposite side as well, and some will even require bursting open with gunpowder, but I cannot explain everything in these pages; I must of necessity leave much for you to learn by experience, and you must accept my writings and drawings only as so many "hints." Split the two halves again, making quarters, and, if the tree is a big one, again, making eighths. These pieces you must now split just the same as you did the shingles. I don't mean that you are to put them up on end as you did the billets out of which you knocked the shingles, but that the direction in which the slabs are to be run out is just the same as in the case of

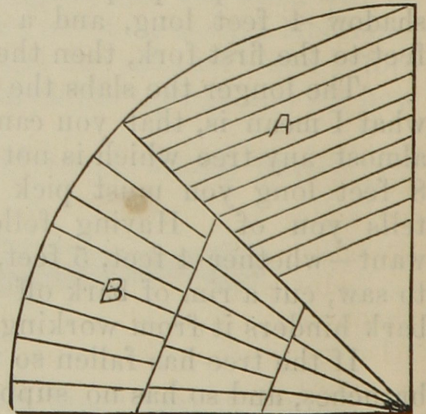


FIG. 9.

the shingles (see A, drawing, fig. 9). This is also the way to run off posts for your fencing, but in splitting rails for fencing you just go on dividing the eighths into sixteenths, and so on till you have them the size you require, or, if it is a big tree, then subdivide as you see done in the drawing (B, fig. 9).

All timber for building purposes will last much longer if felled in the winter time; the very worst time is in the spring, when the sap is in full vigour; but in our, at times, dry climate the full rush of the sap cannot be told to a month—it depends so much on whether rain has fallen or no.

I will suppose the size of your hut to be 24 feet by 12 feet; put up this well, and you can at any odd time add a “lean-to” behind, or at the sides, as you may fancy or require. The height of the rooms we will make 8 feet. The slabs can be put either upright or on their ends—that is, perpendicular, or lying down on their edges—that is, horizontal. I must confess to being strongly prejudiced in favour of the horizontal method, for it has several advantages: first, shorter slabs are required (a very great consideration if timber is scarce and hard to split); secondly, you can make the walls of the hut any height you like; thirdly, it is always weatherproof, for, as the slabs shrink, so they fall down by their own weight and leave no gaps between, whereas upright slabs, after being erected a few months, will have so shrunk that you can put your hand between any of them; also the horizontal slabs look much nicer; they certainly take a little longer to put up, but, as erecting dwelling-houses is not a thing you will be often doing, a little extra time spent to make your home look neater will not be time wasted. As this hut is to take the place of the bark one you first put up, of course you must intend to put a floor to it, so we will arrange for it to be 1 foot higher than the ground, but 18 inches or 2 feet would be better still—if you have no trouble to get straight posts long enough.

By the time you have felled the trees and split the slabs and shingles for the hut you will have become tolerably skilful in the use of the axe, saw, and wedges; but you will now have to try your hand at adze-work, for the adze is the principal tool required in erecting a slab house. It is a nasty tool for anyone not used to it to tackle, and you must use it with great care at first, keeping your legs out of the direction of the way you are cutting, or the result will be that you will get a most frightful cut on the foot or leg. As it is a tool *necessary for all bush work* you must not *shirk learning to use it*, awkward though you will find it; never mind, persevere, and by-and-by you will gain confidence, and perhaps be trying to emulate the ship carpenter by splitting a penny in two when held to the floor by the naked toe.

Get six round posts 12 feet long and not less than 12 inches through at the small end; these are for the corner and middle posts. Also get fifteen ditto, not so thick (6 inches will do), and 8 feet 8 inches long; also seven ditto, 12 feet long and 9 inches thick, for ground-plates; also two wall-plates, 24 feet by 6 inches thick, and

three ditto, 12 feet by 6 inches, for end and middle wall-plates. You will now have to take your first lesson in squaring these logs; but, as this will be a trouble to you, I will not tell you to square anything that is not absolutely necessary. Begin with the ground-plate; knock off the bark, stretch a chalked line along its whole length, on both its sides and about one-third of its thickness down; a bit of charcoal rubbed on the line will do as well as chalk, and will leave a good black mark on the white surface of the fresh-barked saplings. It is a great difficulty with new bushmen to get these two chalked lines on the same level, and the consequence is that, when intending to make a square post, it comes out with four flat sides certainly, but the post itself is *lozenge* shaped. I will try and show you how to do it. Look at the drawing, fig 10. A B is the chalked line; before striking it, saw off both ends of the log *quite straight across* the log—that is, at *exact right angles*. Now drop a plumb-line from A to C, then do the same from B to D, at the other end; next stretch the line from C

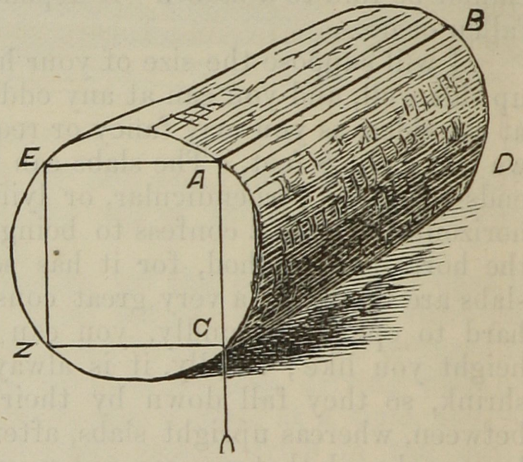


FIG. 10.

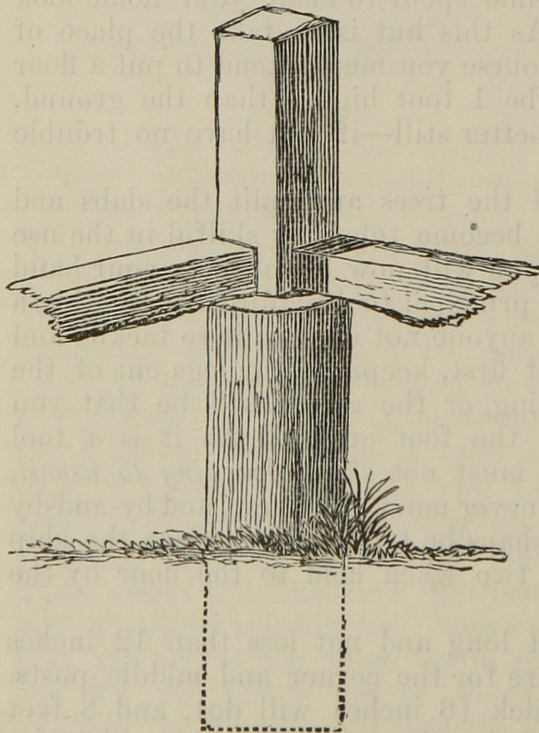
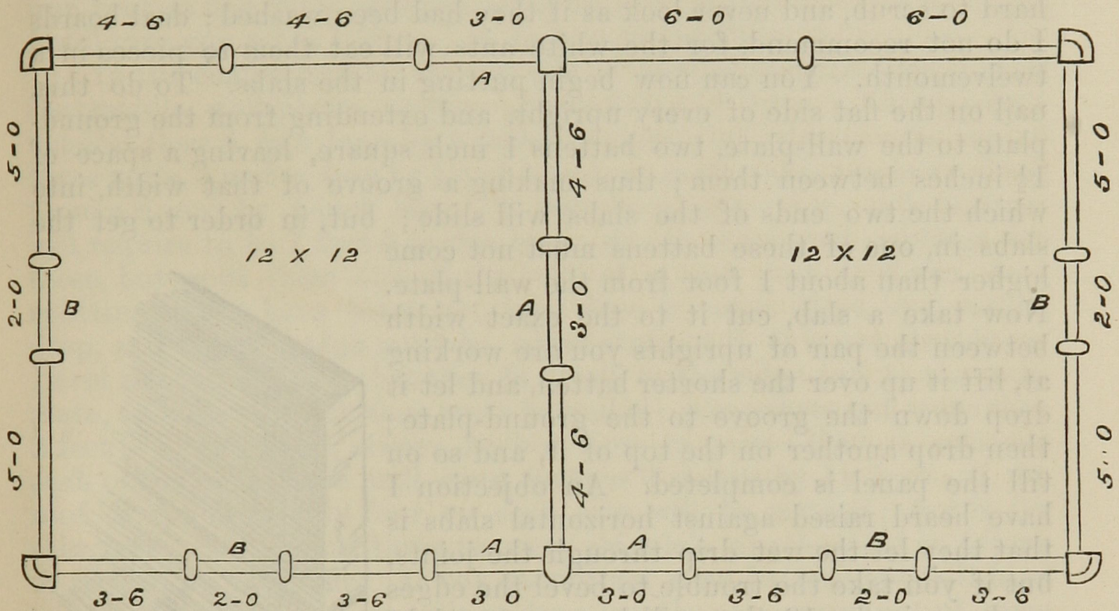


FIG. 12.

to D, saw cuts down to these two lines, every 6 inches or 9 inches apart; then take an axe and knock off the whole slice, finishing all smooth with the adze. You have now got one side squared, and that is sufficient for the ground-plates; but if you want a square post, then drop the plumb-line from A to E, do the same at the other end, stretch the chalk line and smooth off as before; then treat the sides, C to Z and Z to E, in the same way. Do the other ground plates the same way, and then mark a chalked line down the centre of this flattened side; this is for a guide for the mortise-holes that you will have to put in for the other posts. The top wall-plates will require squaring on two sides—that is, above and below; mark also the centre line for the mortise-holes in them as well. Now take the four large corner-

posts and square two sides of them for 9 feet of their length; but these two squared sides are not to be opposite ones like the wall-plates, but the *two adjoining* sides that are intended to face inwards (see fig. 12); the two main centre posts square on *three* inner sides; the fifteen smaller uprights square on the two *opposite* sides, and for their whole length. On the top and bottom of these latter posts cut a projecting tongue, 3 inches x 2 inches and 4 inches long; this is to fit into the corresponding mortise-hole in the ground and wall-plates; the distance these are to be apart is optional, according to the doors and windows you intend to have; but I have marked on the plan allowing for two



PLAN SHOWING POSITION OF POSTS FOR TWO-ROOMED HORIZONTAL SLAB-HUT.

doors and two windows to each room, for there is nothing like plenty of openings in our hot climate. The top of the four corner and two centre posts you must also tongue, but make it longer, say 6 inches.

Now erect the four corner and two centre posts, putting them 2 feet 6 inches in the ground; try them with the plumb-line that they are perfectly upright, also that they are perfectly level, by placing a straight-edged batten on the top of the posts, and a spirit-level on the top of it; then put on the wall-plates (having first mortised the holes for the tongues of the posts to go into), but do not nail them as yet, and ram the earth firmly around the posts. Next place a short stump (12 inches thick) between each of these upright posts, let it be 2 feet in the ground, and the top sawn off level with the squared shoulder of the main posts—that is, it will project 6 inches above ground; then fit the ground-plate so as to rest, at each of its ends, on the two shoulders, and supported in the middle by the stump. The under side of this plate being round, you will have to trim the ends so as to let it sit firm and level; then nail with stout nails or, better still, bore an inch auger hole through the plate and into the corner posts and stump, and plug with a hardwood treenail to fit; do the same with the other ground-

plates; then mark off and mortise the holes for the smaller posts, place them in, lift up the wall-plate, and slip the tongues into the holes in it, and finally nail it down. Fix cross-pieces for the doors and windows, and also put two additional ground-plates in each room; these must have their upper side squared, and must rest on stumps put 2 feet in the ground.

Now start putting the flooring down—it will make the rest of the work easier to be got at; if you can afford it, get sawn boards for the floor; if not, you must use slabs adzed smooth; but they are nasty things for this work, and the women folk do not like them, for they are hard to scrub, and never look as if they had been washed; deal boards I do not recommend, for the white ants will eat them to pieces in a twelvemonth. You can now begin putting in the slabs. To do this, nail on the flat side of every upright, and extending from the ground-plate to the wall-plate, two battens 1 inch square, leaving a space of $1\frac{1}{2}$ inches between them; thus making a groove of that width, into which the two ends of the slabs will slide; but, in order to get the slabs in, one of these battens must not come higher than about 1 foot from the wall-plate. Now take a slab, cut it to the exact width between the pair of uprights you are working at, lift it up over the shorter batten, and let it drop down the groove to the ground-plate; then drop another on the top of it, and so on till the panel is completed. An objection I have heard raised against horizontal slabs is that they let the wet drip through the joints, but if you take the trouble to bevel the edges as shown in fig. 13, they will be as water-tight as a weather-board house, for their own weight will keep them close, no matter how much they may shrink; but be sure you put the bevel the right way, or the water will run in instead of out. Never mind fitting the top slab close to the wall-plate, for there will soon be a space there, through the shrinkage going on, and you can fill it up at any after time by putting in a narrow slab. Finish all the other panels in the same way, and the hut will then be ready for the roof.

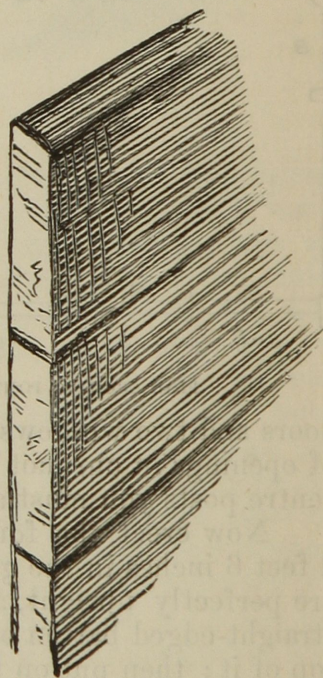


FIG. 13.

ROOFING THE HUT.—If you can afford to buy galvanised corrugated iron, I strongly advise you to roof with it and not with shingles, for these reasons: it never rots; it is fire-proof against the burning sparks of a bush fire; it lets in no rain, even after the longest drought; and the water caught from off it is the best you can possibly have for drinking and for all domestic purposes, including dairy work, and will keep sweet and clean in tanks under ground, whereas the water from a shingle roof is always more or less dirty, discoloured, and quite unfit for washing butter or for dairy purposes. Iron also requires a lighter

roof, fewer rafters, and very few battens, and is more quickly and easily put on. Still, shingles have their advantages, and many people prefer them: first, you can get them on your own land, or on adjoining Crown lands, so that there is no money out of pocket to procure them—only labour expended; they are also cooler in summer and warmer in winter than sheet-iron; in addition to which they have this great advantage, they are *hail-proof*, for it has several times occurred in this colony that a heavy hailstorm has completely riddled an iron roof, so much so as to necessitate a new one. Another advantage: a strong gale of wind sometimes comes and whips off the whole of the iron roof at one blow, whereas shingles can only go one at a time; so I will give you a few “hints” as to how to put them on.

In the centre, and on the top side of each of the two ends, and of the middle wall-plates, mortise a hole for, and fix in, a “king-post” not less than 4 feet long by 4 inches square; cut slots in the top of these posts, 3 inches deep by 1 inch broad, so as to enable you to fix along them a 6-inch by 1-inch board, 24 feet long, as a ridge. The rafters will require to be 7 feet 6 inches long; do not use round saplings for these, but split them out of the butt of a tree, just as if you were splitting rails; have them not less than 2 inches thick by 4 inches deep, and the top edge must be adzed straight if it is not already so. Bevel the two ends so that they fit nicely to the ridge and to the wall-plate, to both of which they must be nailed; place them not more than 2 feet 6 inches apart, always having them in pairs—that is, opposite each other. On these nail sawn battens 3 inches by $1\frac{1}{2}$ inch; if the roof is for iron only four on each side will be wanted; but if for shingles, you will want three to every shingle’s length—that is, fifteen or sixteen on each side. If you cannot get sawn battens you will have to adze down saplings or split as long lengths as you can out of some easy-splitting tree, but you must adze these smooth, for it is *essential* to a *shingle roof* that the battens be all level and smooth; also they *must* be put on *perfectly horizontal* and *equidistant*—then you will have no trouble with the shingles. As I suppose your shingles are 18 inches long, a batten must be put every 6 inches, leaving, if the batten is 3 inches wide, a space also of 3 inches between each one. As a new hand at bush work it may, perhaps, surprise you to be told that *one* nail is only required for each shingle—it is quite sufficient; if you put *two*, you will probably split the shingle, for they *will* curl up or contract with dry weather, and expand with wet, do what you will, and the one nail allows them to do this without cracking. Do not attempt to drive the nail without first boring a hole for it, and bore this hole $4\frac{1}{2}$ inches from the top end. You can do this with a gimlet and each shingle separately, but you will find it a most awful bother, and if the shingles are thick and at all seasoned (as they should be) your wrist will be pretty badly strained before you have done; so buy a brace and half-a-dozen bits (it is a tool you will always be wanting for all sorts of jobs), and fix a slab upright in the ground; on this, just about the height of your waist, fix a box or frame that will hold three or four shingles at once; bore a hole through this, exactly where you want the

hole to be through the shingle; then slip in some shingles, and by using the brace and bit you will get through half-a-dozen in the time of doing one with a gimlet, and the hole will always be in the same and right place of each individual shingle.

To shingle a roof requires considerable skill and some practice before you can do it properly, but these "hints" may perhaps teach you sufficiently to enable you to experiment upon your own house if you like. So take as many shingles as will make one row the length of the hut, put them in bundles of three or four into your box or frame, bore a hole through them, take them out, turn them over, put them in again and bore another hole at the opposite end, then saw them into two, exactly across the middle; thus making two shingles 9 inches long out of each one, and with a hole bored exactly in the middle of them—these are for the first or bottom row, and also for the last or top row. Now take these halves and nail them on to the lowest batten (which must be at the very end of the rafters), putting them quite close together and letting them project exactly 3 inches. Do not put the whole row on at once, but work upwards in breadth just as wide as you can conveniently stretch over, commencing at the right-hand corner as you face the building. Now take a full-length shingle and place it over the joint between the two halves (so as to completely cover this joint), and nail it; the top of this will be just up to, but not on, batten No. 3 (see fig. 14), and the nail will be in the centre of batten No. 2.

Then put on another full-length, the top of which comes up exactly to, but not on, batten No. 4; the top of the next batten will in the same way come up to batten No. 5, and so on up to the ridge, where the half-shingles will be again

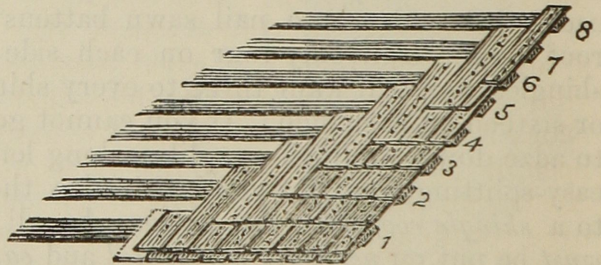


FIG. 14.

wanted to finish off with. If the shingles are all one length (as you can easily make them) and the battens all exactly a true distance apart (as they ought to be), you will find no difficulty at all in the matter; the only care required will be, as the shingles are not all one width, to choose such ones as will properly protect the joint of the lower row by covering it with the upper one well on to each side. Notice that batten No. 2 is 6 inches from No. 1; all the others are just 3 inches apart. When you have both sides done, put on a ridging of galvanised iron if you can get it; if not, then one formed of two sawn hardwood boards, 6 inches by 1 inch, nailed saddle-ways together, and nailed also to the top battens. A roof covered with shingles is a great weight, and has a tendency to bulge out the walls; so nail a light batten inside from each rafter to its opposite, making a figure A of each pair; also put diagonal stays, as shown previously on bark huts. For the gable ends the best way is to nail up with sawn boards, but if you cannot obtain them, choose thin slabs and nail to the

rafters and the king-posts, cutting the ends to the slope of the roof as required. If you cannot afford to buy windows, a shutter made out of old deal cases does very well, for in our fine climate windows nearly always are wanted open; as long as you have the power to close them at will when a storm comes, or on a cold night, that is all that is absolutely necessary. Doors also are best made of deal; when made out of slabs—as can easily be done—they are but clumsy things. The fire-place for a slab hut can be made exactly like the plan I gave for putting up bark chimneys, only substituting slabs for bark.

You have now a comfortable weatherproof house over you—one that is warm in winter and cool in summer—and, if well and carefully put up, by no means unsightly to look at. You can, at your leisure, add a verandah and other rooms, not forgetting a comfortable kitchen for your wife.

I have dwelt fully upon this slab hut because it is a type by which you can put up stables, barn, milking-house or woolshed—the only difference being in the size; the same method of plan and work applies to all.

DOORS AND WINDOWS FOR A HUT.—I purpose now giving you a few hints as to how you can, even at a very trifling expense, make your new home quite comfortable—that is, if you are at all a handy man with tools; and any man, no matter what his trade may have been in the old country, can easily acquire the little skill requisite for Australian bush carpentering, if he only tries to do so. I strongly urge you to acquire this skill, for you can then, in a thousand and one ways, make your house snug and pretty, your fences secure, the barn and stables weatherproof; in fact, your farm will be comfortable and complete; and what is success but comfort?

I have not much to say about doors and windows, but a hint or two may perhaps help you. In our fine climate windows can well be dispensed with until you have money to spare. A wooden shutter made out of old packing-case wood will be quite sufficient protection from the weather, for it will be seldom, even if you have a window, that it will not be left open, especially if your hut has a verandah round it. If you are close to town and can get glazed sashes cheap and without trouble, then do so by all means, but if your selection is far in the interior, and carriage expensive, then do without, using only a shutter.

Doors can be made of deal or other light wood. If you can get sawn timber they are easily made by nailing a board across the top, middle, and bottom of the requisite number of boards cut to the length of the doorway; hang it with stout T hinges, they are the best for all bush-house work. If you are located where you cannot get

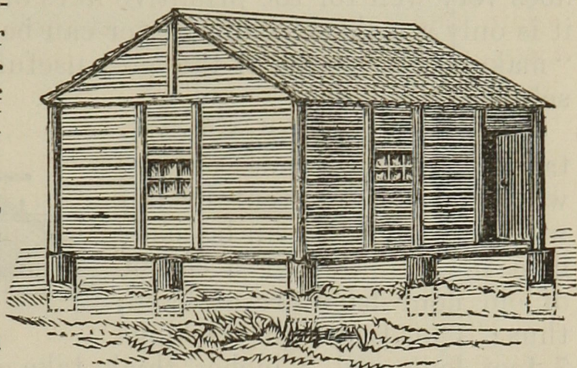


FIG. 15.

sawn boards, then you must split light thin slabs and use them instead; but a slab door is heavy, and apt to drop at the end, so nail a batten as a diagonal stay from the heel to the top corner, and hang it the same way as I shall by-and-by tell you to do when making a crane for the fire-place. Doors are frequently made out of a sheet of bark fastened on to a frame of saplings, but they are ugly-looking things and only fit for a bark hut.

In the far interior, where there is no timber to split or to get bark off, an old bag nailed on to a frame is what you may use, and it does very well for the primitive huts of our pioneer settlers; of course it is only a makeshift till better can be got, but the art of contriving "makeshifts" is one of the most useful of accomplishments that a new selector can possess.

HUT FURNITURE.—A capital stretcher for one person, when living in a tent or hut with earthen floor, can be made in a few minutes, if a couple of old flour bags are at hand, thus: Cut two light saplings

7 feet long and 2 inches thick, take off the bark, smooth down the knots, slit a hole in the two bottom corners of the bag, and run the sticks through the mouth of it and through the corner slits; thread the other bag on in the same way; now cut two logs, about 1 foot thick and 1 foot wider than the width of the bag, place these logs one for the head and one for the foot of the stretcher, lay the projecting ends of the saplings on them, bore a 1-inch hole in the logs just inside of each spar, and put a peg in; this keeps them from coming together when your weight is on the bag. By this simple plan you can keep yourself off the frequently damp, if not wet, floor of a tent, and so save yourself from future years of rheumatic pains, fever, piles, etc. Although the Australian climate is mild, and exposure does not tell so soon on the constitution as in Europe, yet it does eventually tell; and my advice to you is—although you may be young and strong now, yet never neglect taking precautions against ill-health if you are able to do so; do not, except when travelling, sleep on the ground just because you are too lazy to make a stretcher.

Instead of resting the stretcher on logs, you can put stout forked saplings in the ground, well ram the earth around them, and put the ends of the stretcher spars in these forks (see fig. 17), then nail on a head-board.

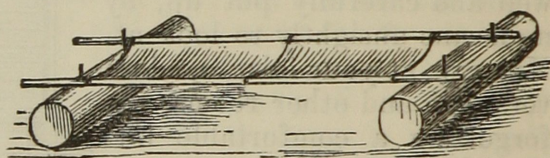


FIG. 16.

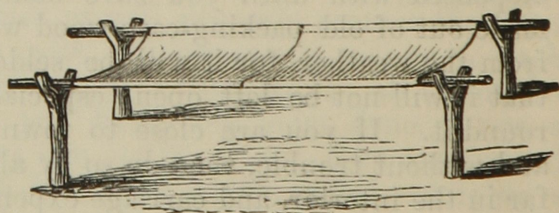


FIG. 17.

All through these pages I have presumed that you did not select your land till you were married, for the woman's skill is necessary to the successful working of your farm; not that I advocate her working in the fields—that is man's work—but in the dairy, the

poultry-yard, the garden, and in cooking you a good meal, she is required before you can call yourself successful (of course I am now only speaking in a practical sense); so devote a few days to making her the various household things I am now going to tell you about.

First make a CRANE to the fireplace. For the want of this many a woman gets her foot scalded, or her clothes catch fire, or she gets a nasty sprain, besides being annoyed all day long just for the want of this simple contrivance. The heavy pot in which the meat is boiled, the large boiler full of clothes, etc., are no joke for the wife to lift on and off, so make her a crane; it is a well-known old English kitchen convenience, but in Australia it is seldom seen; yet in a bush hut, with its large fireplace, it is absolutely necessary. Fig. 18 shows how it is made and fitted to the fireplace. Get two pieces of hardwood about 5 feet long, mortise the end of one into the

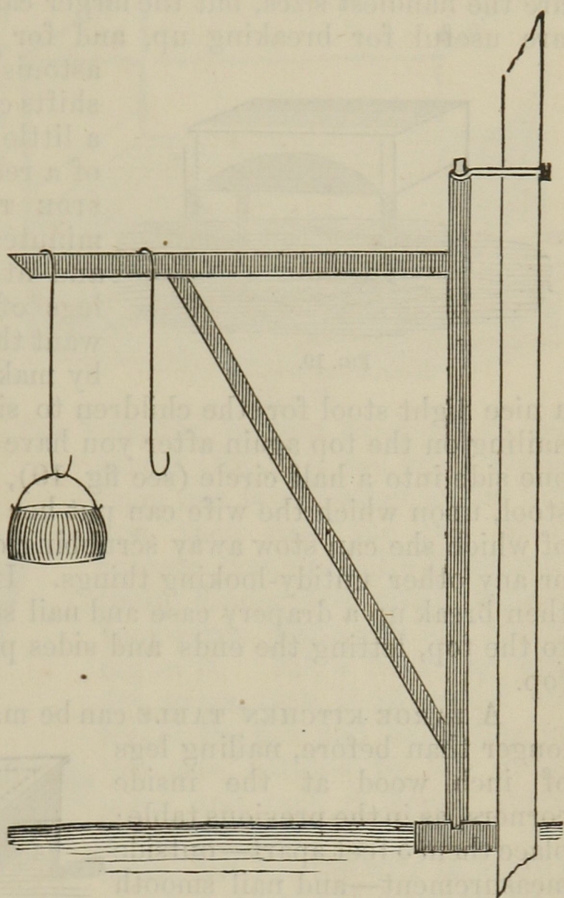


FIG. 18.

face of the other and put a diagonal stay, as in the sketch; make a round tenon at the bottom of the heel-post, and bore a hole in a block of wood which will just fit this tenon; sink this block level with the stones of the fireplace floor, and close to the right-hand edge of the fireplace; on it the crane will work. The top of the heel-post must also be rounded off, and a $\frac{1}{2}$ -inch iron bolt must be got from the blacksmith, one end of which must have a *round eye*, into which the top tenon is put. A hole is then bored quite through the corner-post of the chimney, the bolt pushed through, and the nut screwed on; it will then be strong enough to stand the weight of all the pots that can possibly be hung on it, and all the wife has to do to get them on or off is to swing the crane to her. They can then be easily got at, as she is away from the fire. A strip of zinc tacked on to the underneath side will hinder the wood charring, no matter how big the fire.

TABLES, CHAIRS, AND BEDSTEADS you can easily and cheaply make out of old deal packing cases. In the old country it is very likely deal boxes were valuable and but seldom seen by you, but out here they are everywhere knocking about, and you can buy them at a

very low price from any country store or town shop. Cases that originally contained jam tins, fruit bottles, brandy and other spirits, are the handiest sizes, but the larger cases that once contained drapery are useful for breaking up, and for wardrobes, shelves, &c. It is

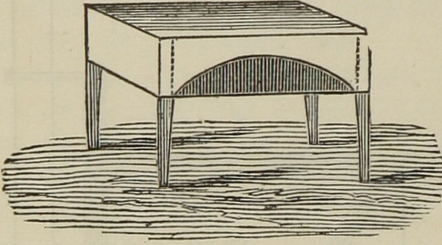


FIG. 19.

astonishing what a variety of make-shifts can be constructed, by exercising a little ingenuity, out of the rigid form of a rectangular box. A handy small SIDE TABLE can be made in a few minutes, thus: Take a brandy case and at each corner *inside* nail four legs of $\frac{1}{2}$ -inch board, as long as you want the table to be high (see fig. 19): by making the legs shorter you have a nice light stool for the children to sit on; by using a gin case and nailing on the top again after you have fitted the legs, and cutting out one side into a half circle (see fig. 19), you will have a strong and light stool, upon which the wife can put her tubs when washing, and inside of which she can stow away scrubbing or blacking brushes, floorcloths, or any other untidy-looking things. If you want a *bigger table* still, then break up a drapery case and nail some of the smoothest boards on to the top, letting the ends and sides project some distance from the top.

A LARGE KITCHEN TABLE can be made by taking *two* cases, a little longer than before, nailing legs of inch wood at the inside corners, as in the previous table; place them 5 feet apart—outside measurement—and nail smooth boards, 6 feet long, from one to the other. The width of the top should not be more than 3 feet, and as the sides should project 4 inches, the boxes will only want to be about 2 feet 4 inches long, by any depth and width. The ends of the boards should project 6 inches, and a side board should be nailed from box to box, as shown in fig. 20. By nailing on the tops of the boxes again after fixing the legs, and cutting out the semi-circle in one side, as you did in the washing-stool, a capital shelf or cupboard is made of each box, in one of which the wife can keep her tablecloth, etc., and the other will hold your farm books, accounts, and papers, and be always handy.

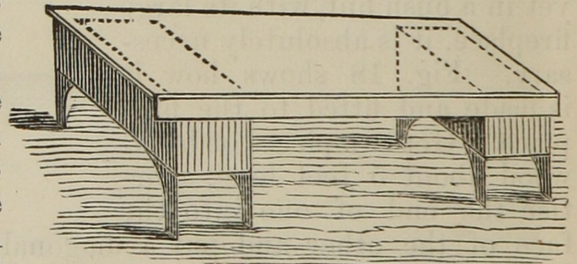


FIG. 20.

A CAPITAL SOFA can be made in exactly the same way as the table, except that one box must come flush with the ends of the top boards, and a head-board, 9 inches broad, must be nailed so as to keep the pillow or cushions on; the wife can cover the whole with chintz, and it will really look, and be, a nice piece of furniture.

Even a GOOD BEDSTEAD can be also made in this double-box manner, and inch battens nailed on the outside of each corner, carried

up as high as is necessary, cross ones nailed to them, and so a mosquito net can be hung all round (fig. 21). It is better in the case of the sofa and bedstead to nail the side-board lower down than you did when making the table.

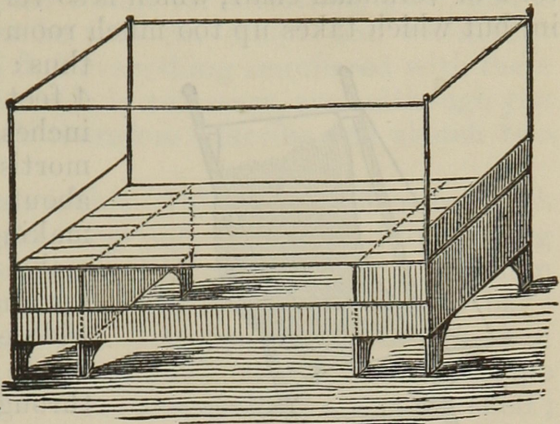


FIG. 21.

The old boxes out of which I showed you how to make sofa, bedstead, tables, and stools, can be turned into an EASY CHAIR in a very few minutes and with very little trouble, thus: Take an old gin case and nail on to the two ends the battens as shown in the

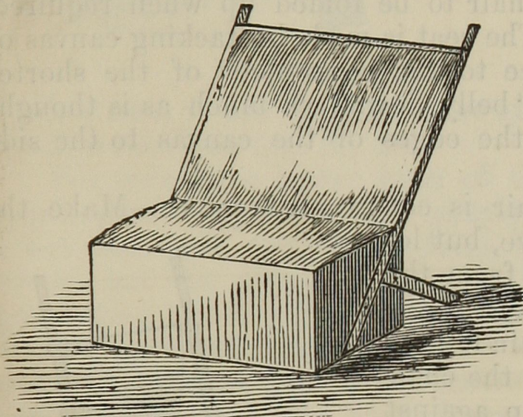


FIG. 22.

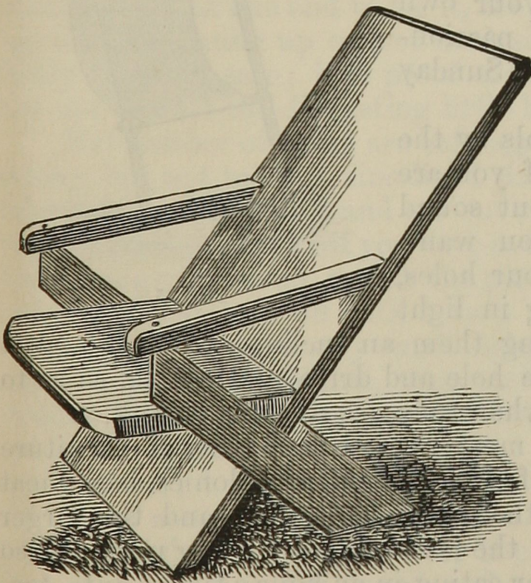


FIG. 23.

sketch (fig. 22), nail cross pieces from one to the other at the top, and then nail the two short battens that project out behind; these hinder the chair tipping backwards when you are lounging in it. Fill a flour bag with dry grass, tack it all round the top of the box and extending up the side battens to the cross-piece and tack it firmly there. Your part of the work is now done; but get the wife to make a cover of chintz or holland that will go over the whole, but which must not be fastened permanently, or it cannot be got off to be washed. It will not be long before your wife makes this her favourite seat, for a more comfortable one for sewing or reading in could not be bought out of a shop. I have known these chairs to be retained in the drawing-room even after the owner had become a rich man, the mayor of the town, and member of our Legislative Assembly.

Another easily constructed chair I take a sketch of from the *American Agriculturist*; the drawing (fig. 23) explains itself.

SQUATTER'S OR VERANDAH CHAIR.—Then there is the squat-

ter's or verandah chair, which is so very comfortable to rest and smoke in, but which takes up too much room to be used indoors. It is made

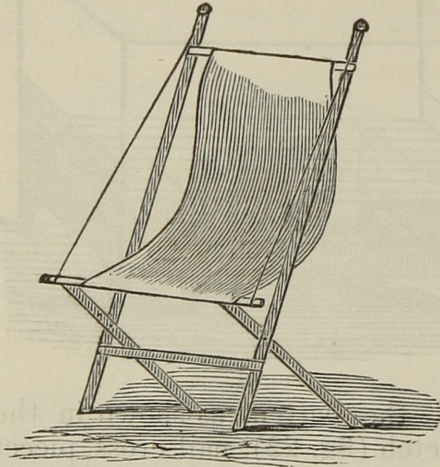


FIG. 24.

thus: Take two pieces of wood about 4 feet 6 inches long, and 2 inches by 2 inches or thereabouts in thickness, mortise cross-pieces at the top, and about 6 inches from the bottom, thus making a frame (see fig. 24); then make a similar but a smaller frame for the back legs—this must be just wide enough to slip inside the larger frame; now put a half-inch bolt through the two where they touch or cross each other; then fasten a piece of rope on each side as shown; this takes the whole strain and allows the chair to be folded up when required.

The seat is made by tacking canvas or bagging from the top cross-piece to the cross-piece of the shorter frame, letting it hang slack, or "belly down" as much as is thought most comfortable; do not tack the edges of the canvas to the side pieces.

A simpler form of this chair is constructed thus:—Make the larger of the two frames, as above, but let the lower cross-piece be 1 foot from the ends; then nail with strong tacks canvas, as before, from top to bottom, again letting it hang down loose in the middle; the chair is then made. By resting the top against the side of the house, any inclination can be given to it, and in it, under your own verandah, covered with vines and passion-fruit, can be spent your well-earned Sunday afternoon's rest (see fig 25).

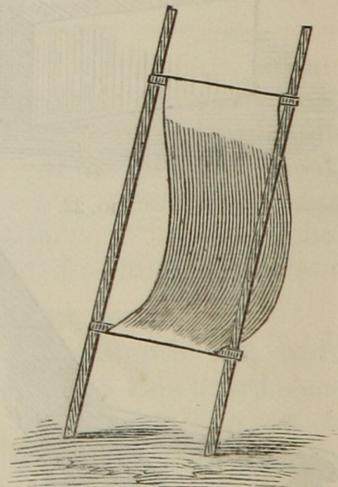


FIG. 25.

You can make forms and stools by the dozen, and in a very short time, if you are splitting slabs, by choosing a stout sound one, cutting it to the length you want, smoothing the top face, boring four holes, one near each corner, and driving in light round saplings for the legs, giving them an incline outwards; cut a nick in the end that goes into the hole and drive in a wedge, so as to keep these legs from falling out when they get dry and shrink.

MEAT SAFES.—One of the most necessary pieces of furniture required by the settler in any of the Australian colonies is a meat safe. In the summer time both the small house-flies and the larger flesh or blow-flies are in myriads; the latter deposit living maggots, so that meat left uncovered is unfit for eating in an hour's time; ants, too,

in some districts are always on the forage for something good, and if only one finds out your eatables he tells the others, and when your next meal-time comes round you find everything smothered with these disgusting little insects; so a meat safe is necessary, even although you may be but living in a tent; I will therefore describe and sketch two or three sorts.

The simplest and easiest made is this: Take a clean flour bag with no holes in it, and hang it up to the ridge pole of your tent by a string fastened to one of the bottom corners, and by another string placed on the same side seam but about 6 inches from the mouth of the bag; then put in a board some 7 inches wide, 6 inches less in length than

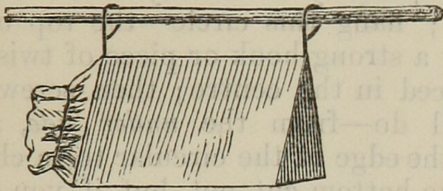


FIG. 26.

the bag; this flattens out the bottom, making a sort of shelf; put in your meat dish and anything else requiring protection, tie up the mouth of the bag closely, and this safe is both fly and ant proof. It can with advantage be hung from the branches

of a low tree, it will then get more air than in the tent, for its fault is that it is too close (see fig. 26).

For indoors, a better form of the foregoing is one that I have myself used for years; it is simply made thus:—Take a board 12 inches wide and, say, 2 feet long, bore a gimlet-hole close to each corner; get two pieces of common fencing wire 4 feet long, also a light batten 1 inch $\times$ $\frac{3}{4}$ inch the same length as the board; bore a hole close to each end, thread the two wires each through one of these holes, slip them along till the centre of the wire is reached—that is, 2 feet; bend down the ends, insert them through the holes in the plank, and clench. Now tack mosquito-netting over the whole, leaving enough slack at one end to tie it, the same as you did the bag safe. It can either be hung up or not as desired, and it makes a nice airy perfectly fly-proof safe; it is proof also against the larger sort of ants, but not against the disgusting little black ones.

But neither of these are safe against rats or mice; so get a sound strong, but not too big, zinc-lined drapery case from the nearest store, take out the zinc lining, and cut out a large piece from the centre of the two ends and the back; if you have not got a small saw you can do this by boring auger holes all round the piece; it will then easily knock out, and you can smooth off with a rasp or chisel. Now cut the zinc into sheets, and puncture very small holes in it with a sharp nail, till each sheet is perfectly riddled, then tack them on to the outside of the wooden box, so covering the large holes cut in it. A door can be made out of the spare top of the case, but cut it smaller, so that it will fit easily inside; hang it with a pair of butt hinges, and tack all round the edges some calico, flannel, or a strip of leather, so as to make a perfectly tight fit when the door is closed. Now nail four legs to the case of 1 inch $\times$ 2 inch board, and place these legs each in an old jam, or salmon tin, which you must keep full of water; see that everything

is clear of the wall, and you will have a rough but serviceable safe that neither rats, mice, ants, nor flies can get into.

Of course if you are near town you can buy a good safe cheap enough, or you can buy the perforated zinc and make a frame one according to your skill; my directions are only for anyone who may be located far in the interior.

A capital form of *safe for hanging meat*, such as a whole sheep just slaughtered, or the parts of a bullock you do not intend to salt down, is made thus: Get a piece of round board, or rather nail boards together till you can cut out a circle 2 feet or even 3 feet in diameter, according to the quantity of meat you are likely to have at once; hang this circle—the top of a cask will do—by a strong hook or piece of twisted fencing wire placed in the centre; then screw in hooks—wire will do—from the *under side*, and tack all around the edge of the circular top a clean flour bag with the bottom cut out, but if you can get osnaburg or cheese-cloth use it instead of the bag, for it is more porous to the air, and you can make it to hang down low enough to cover a whole sheep. The meat is hung to the hooks and the bag tied closely below it (see fig. 27).

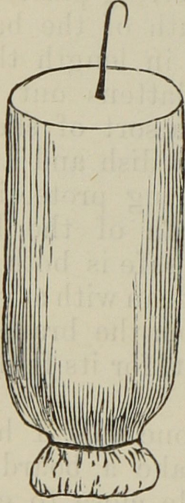


FIG. 27.

Having pointed out to you, the new comer, the necessity for your learning Australian occupations before selecting land; having shown you how to fall trees, to split slabs, rails, posts, and shingles; to strip bark; to put up tents, bark or slab huts; how to go about selecting land; the best situation for the house, and how to cheaply but comfortably furnish it, I conclude.

THE
FLORA OF QUEENSLAND:

BY
FREDK. MANSON BAILEY, F.L.S.,
COLONIAL BOTANIST.

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THE FLORA OF QUEENSLAND:

By F. M. BAILEY, F.L.S.

DESCRIPTIVE.

As may be inferred, Queensland, lying within two zones (10 degrees to 29 degrees south), and with over 2,500 miles of coast, possesses a remarkably rich and varied flora. The dense scrubs frequently bordering the rivers contain trees which supply valuable timber, whose stems are often clothed with superb climbers, and the undergrowth is intermixed with ferns exceedingly beautiful and of almost endless variety. The more open or forest country and the downs are covered with rich and nutritious grasses and other fodder plants. Few plants are to be met with of a poisonous or deleterious character, while many are extremely beneficial to man. From some, drugs that are in use both in Europe and Australia have been prepared; the barks of many are used advantageously in dyeing and tanning; and from the leaves of others oil of a highly fragrant nature has been obtained. Though there are many beautiful cabinet woods, and woods of great value for railway sleepers and all uses in which endurance is required, still only a very few of the timber trees are at present cut for use, and these are a mixed lot sold under the names of "hard" and "soft" woods. The hardwoods are principally supplied by the Eucalypts, and denominated Ironbark, Gum, Box, Peppermint, Stringybark, and Turpentine. The softwoods are almost entirely derived from the various Pines. Hardwoods are generally obtained in open or forest country, softwoods in the scrub lands on the borders of rivers and the rich moist lands often met with on the tops of the ranges; yet this rich scrub soil often produces some of the very best hardwoods—as, for instance, the Johnstone River hardwood, which is considered second to no timber in Australia for strength and durability; also Thozet's Box, one of the most valuable Eucalypts, found in the scrubs bordering the Fitzroy.

In connection with the foregoing remarks, it would perhaps be as well to notice separately a few of the useful products of the colony, giving the source from which they are or may be derived.

Amongst the hardwoods, where strength and durability are required those known as Ironbark take first rank. Of these there are several kinds, the best being obtained from *Eucalyptus siderophloia*, of which there are two kinds of wood, one red and the other a brownish-grey—both excellent timbers, though the red is the favourite; *E. crebra*, or the Narrow-leaved Ironbark, which has a greyish wood,

very strong and durable; and the Palmer River Ironbark, better known by the lemon-like fragrance of its leaves, from which it received its local name, than as a timber. The wood of this last, though very hard and of a rich red colour, is usually small and pipy.

The trees known as Stringybarks supply excellent timber for sawing and splitting; the kinds cut under this name are usually *Eucalyptus acmenioides* and *E. eugenioides*. Nearly resembling these in bark are the trees sometimes called Turpentine (*E. microcorys*)—a very hard, strong, durable timber; *E. Baileyana* and *E. resinifera*, two excellent timbers with a fibrous bark, from which circumstance they are at times known as Stringybarks.

The timber generally known as Gum is furnished by those Eucalypts which annually shed their barks, as the Blue Gum (*E. tereticornis*), the Poplar Gum (*E. platyphylla*), the Grey Gum (*E. saligna*), the Spotted Gum (*E. maculata*), the Woollybutt (*E. botryoides*), and the Moreton Bay Ash (*E. tessellaris*). The bark of the last two is persistent at the base. There are also several others called Gum-trees, but those noticed furnish the best timber. The so-called Box is a name under which several trees supplying good useful timber are known, as Poplar Box (*E. populifolia*), Gum-topped Box (*E. hemiphloia*), Thozet's Box (*E. Raveretiana*), and also the Brisbane Box (*Tristania conferta*).

Two trees are designated Bloodwood. The Common Bloodwood (*E. corymbosa*) is only adapted for using whole, as it often contains cavities in the wood so full of gum as to render it useless for sawing; it is, however, the favourite timber, on account of its durable nature, for house-stumps, piles for bridges, and other works where it can be used uncut. The White Bloodwood (*E. trachyphloia*) is very similar, but the wood is of a lighter colour and not quite so durable.

The hardwood of the Johnstone River is furnished by a species of *Backhousia*, *B. Bancroftii*. This is a very tall erect tree, and so far as is yet known the wood is both durable and strong, does not crack or warp, and is easy to work. The Broad-leaved or Paper-barked Tea-tree (*Melaleuca leucadendron*), the Mahogany—Tom Russell's Mahogany, as it is sometimes called—(*Lysicarpus ternifolius*); and the Swamp Mahoganies (*Eucalyptus robusta* and *Tristania suaveolens*), are timbers of a high quality, though the last-mentioned is useless except under water, when it is extremely durable.

Good timber is furnished by the various Turpentines, especially by *Eucalyptus microcorys*, *Syncarpia laurifolia*, and *S. Hillii*.

The hardest wood, however, of Australia is that of *Erythrophloeum Labouchei*, a tree met with in North Queensland, from the Endeavour River to Normanton. The wood of this tree is a rich red in colour, and takes a high polish.

The soft woods in use are the Bunya (*Araucaria Bidwillii*); Moreton Bay or Hoop Pine (*Araucaria Cunninghamii*); Dundathu Pine (*Agathis*—*Dammara*—*robusta*); the She-pine (*Podocarpus elata*); and several of the *Callitris* under the name of Cypress Pine.

For cabinet and ornamental purposes the following are in high request:—Red Cedar (*Cedrela Toona*)—the Moulmein Cedar of the English market; Yellow-wood (*Flindersia Oxleyana*), and others of this genus, especially *F. australis*; Silky Oak (*Grevillea robusta*); Deep Yellow-wood (*Rhus rhodanthema*); Tulip-wood (*Harpullia pendula*); and Beech (*Gmelina Leichhardtii*), a tree attaining a great size. The wood of this last is in great request for verandah flooring and deck planking.

The foregoing may be said to comprise the woods in use at present, but it is to be hoped that the display of those collected and prepared for the Colonial and Indian Exhibition will create a demand for others equally noticeable for their beauty and utility, as yet unknown to the general public.

Other woods suitable for cabinet-work are:—*Elæocarpus Bancroftii*, a tree with a firm light sapwood and a quantity of very hard prettily marked heartwood, though perhaps its true value will be in its proving a substitute for the American *Lignum-vitæ* in the manufacture of blocks, pulleys, &c., than as a cabinet wood; several of the *Evodias*, all having a white pliable wood; the Satinwood (*Zanthoxylum brachyacanthum*), one of the most beautiful Yellow-woods known; *Geijera Muelleri*, a common tree in most Queensland scrubs, having a large quantity of beautifully marked dark heart; *Siphonodon australe*, another scrub tree whose wood is nearly white, very much resembling ivory when polished; the Bean-tree (*Castanospermum australe*), growing a heartwood somewhat resembling Walnut but apt to warp in seasoning; the Queensland Ebony (*Bauhinia Hookeri*), a rich-coloured hardwood, very suitable for veneering; the Scrub Sandalwood (*Exocarpus latifolius*); the Australian Olive (*Olea paniculata*); and many species of *Acacias* commonly called Myalls or Wattles, and remarkable for their rose-like fragrance.

Handsome woods are produced by the "Dead-finish" (*Albizzia basaltica*), *A. canescens*, *Archidendron Vaillantii*, several of the genera *Terminalia*, *Maba*, *Grevillea*, *Hakea*, *Xylomelum*, *Stenocarpus*, and *Banksia*, the timber of the last five being known as Beefwood; the Silky Oak; the Gulf country Gutta-percha (*Excæcaria parvifolia*), is very prettily marked and conspicuous for its beauty; and the Thready-barked Oak (*Casuarina inophloia*).

Amongst the woods likely to be of service for engraving purposes might be noticed—*Sideroxylon (Achras) Pohlmanianum*, *Siphonodon australe*, *Marlea vitiensis*, *Guettarda putaminosa*, *Maba fasciculosa*, *Bursaria incana*, *Capparis Mitchellii*, *C. nobilis*, *Pittosporum phillyræoides*, *Homalium vitiense*, *Denhamia pittosporoides*, *Symplocos Stawelli*, *Strychnos psilosperma*, and *Melicope neurococca*.

Tanning Barks.—Many of the indigenous plants are known to be rich in tannin; but only a few of the barks are collected for use, and these are almost entirely confined to the various *Acacias*, one kind (*Acacia decurrens*) being the most extensively used, though it is quite certain that several other species yield barks equally rich in this valuable property. Several of the Eucalypts are used, but not to any extent.

The barks of the Mangrove—which trees are so abundant along the coasts—have been used in India and elsewhere for tanning, though the trees in Queensland have never been barked for this purpose. Some idea of the amount of tannin contained in the barks may be gathered from the following analysis of tanning materials:—

Names.	Tannin.	Extract with 10 per cent. moisture.	Dry exhausted residue.
	Per cent.	Per cent.	Per cent.
<i>Acacia Cunninghamii</i>	9·13	16·15	74·72
<i>podalyriæfolia</i>	12·40	29·50	58·10
<i>longifolia</i>	12·67	32·05	55·28
<i>neriifolia</i>	13·91	17·87	68·22
<i>penninervis</i>	14·49	33·06	52·55
<i>decurrens</i>	15·08	26·78	58·14
<i>leptocarpa</i>	10·20	26·41	63·39
<i>polystachya</i>	18·20	22·54	59·23
<i>Rhizophora mucronata</i>	23·85	29·24	46·91
<i>Bruguiera Rheedii</i>	19·48	37·91	42·61

Dyes are furnished by many of the indigenous plants, particularly the genera *Aleurites*, *Mallotus*, *Albizzia*, *Acacia*, *Cudrania*, *Indigofera*, *Xanthorrhæa*, *Baloghia*, *Cedrela*, and *Cynometra*. That the Australian natives are aware of this valuable property of many plants is shown by their curiously stained mats and bags.

From the trees of the *Ficus* genus, of which thirty-four kinds are indigenous, excellent caoutchouc might be obtained, but at present the expense of collecting is too high to leave a profit.

The fruits of Queensland in many cases contain oil in abundance, which would pay for extraction, while the foliage of several of the Eucalypts and others are rich in oil of a most delightful fragrance and high medicinal value. The following species yield oil in payable quantities:—Lemon-scented Ironbark (*E. Staigeriana*); Citron-scented Gum (*E. maculata*, var. *citriodora*); Scribbly Gum (*E. hæmastoma*), the oil of which has somewhat of a peppermint odour; the Turpentine (*E. microcorys*), and *Backhousia citriodora*, yielding also a highly prized essential oil; and the Paper-barked Tea-tree (*Melaleuca leucadendron*), giving the well-known cajeputi oil.

From popular treatises on the Flora of the colonies, it might be inferred that Queensland possessed no edible fruits indigenous to its soil; but though it can hardly be expected that fruits in a wild state will compare favourably with those which have been for many years in cultivation, yet some—as Davidson's plum (*Davidsonia pruriens*), a purple fruit, often as large as a duck's egg, the flesh very juicy and acid—are admirably suited for culinary purposes. The Herbert River Cherry (*Antidesma Dallachyanum*), resembles the common cherry in appearance and size, but is more juicy and of a sharp acid flavour; in fact, jelly made from its fruit equals that manufactured from the

English Red Currant. These two fruits, contrary to the general rule, have but small stones compared with the amount of flesh. The Finger Lime (*Citrus australasica*), the Common Round-fruited Lime (*Citrus australis*), the Native Cumquat (*Atalantia glauca*), and many of the *Eugenias*—especially some of the Northern kinds—are all excellent preserving fruits. The Queensland Nut (*Macadamia ternifolia*), *Elæocarpus Bancroftii*, and others are collected for the sake of their sweet almond-like kernels, but in the case of these two last the extreme hardness of the stone detracts greatly from their usefulness as a fruit.

In Queensland, as in all other places, a number of the plants are supposed to possess medicinal virtues, and many are used in domestic medicine—as the Pennyroyals for tea; but there are some which enjoy a much wider reputation, particularly the bark of the two forms of *Alstonia constricta*—used similarly to the *Cinchonas*—and the extract from the leaves of *Duboisia myoporoides*, which is superseding belladonna in ophthalmic surgery. The gum from the stems and the oil from the leaves of several of the Eucalypts enjoy a deserved renown; the annual weed called Asthma-plant (*Euphorbia pilulifera*) is largely used in relieving or curing asthma, either as a tea (an infusion being made from the dried plant) or as an extract. Another *Euphorbia* (*E. Drummondii*), a dangerous sheep poison, is frequently used by bushmen, in infusion, as a remedy for chronic dysentery or low fever.

Fibres of excellent quality may be obtained from many of the indigenous plants, particularly those of the orders *Malvaceæ*, *Sterculiaceæ*, and *Urticaceæ*. The aborigines are aware of the fibrous nature of many plants, and have utilised them in the manufacture of rope, fishing-nets, and bags.

The fodder plants of the colony are extremely numerous; in the grasses alone there being over 250 kinds, many of which are highly nutritious. Inland the smaller kinds resembling European meadow grasses abound, but in the coast districts are found the larger and coarser species, some of which attain a most luxuriant growth, often reaching the height of ten or twelve feet, and forming large hillocks. Besides grass, many herbs and shrubs enjoy the reputation of being excellent fodder. Prominent among them is the Salt-bush of the West, and the Milk-bush (*Wrightia saligna*) of the Gulf country, both fattening fodders. On the Warrego and Barcoo the tree called Cattle-bush (*Atalaya hemiglauca*) bears a very high character; and these and other shrubs or small trees, particularly some of the *Acacias*—more especially those known as Weeping Myall (*A. pendula*) and the Mulga (*A. doratoxylon*)—come in most serviceable during long droughts. Besides these, growing up with the grasses, are a large number of herbs possessing equally nutritious qualities. No doubt it is owing to this mixture of herbage that the pasture lands of Queensland have obtained their high reputation.

Although the *Labiata* (the favourite order with the bee) is not so well represented in Queensland as in cooler countries, yet the large order *Myrtaceæ* supplies the bees with an abundance of flowers, equally

rich in honey with the *Labiatae*, and blooming all through the year. There are also other orders of the indigenous plants quite as useful for bee culture; and now that so many people are turning their attention to this industry, it may be expected, considering the suitability of climate and indigenous flowers for the purpose, that before long the honey of Queensland will enjoy a reputation equal to that of the famed Hybleau.

LIST OF TREES, SHRUBS, Etc.

Having thus briefly glanced at what some rigid utilitarians would term the economic plants of Queensland, for others of an æsthetic taste a short list of some of the most showy plants will doubtless be acceptable. Space, however, will only allow of a very few being noticed under each head.

TREES OF LARGE SIZE.

Tropical.

Flindersia *Brayleyana*.
Calophyllum *inophyllum*. Domba-tree.
Elæocarpus *Bancroftii*.
Archidendron *Vaillantii*.
Melaleuca *leucadendron*, *var. saligna*. Weeping Tea-tree.
Alstonia *scholaris*.
Diplanthera *tetraphylla*.
Eucalyptus *Raveretiana*. Thozet's Box.

Extratropical.

Ficus *macrophylla*. Moreton Bay Fig.
Araucaria *Bidwilli*. Bunya Bunya Pine.
Agathis *robusta*. Dammara or Kauri Pine.
Olea *paniculata*. Australian Olive.
Syncarpia *Hillii*. Turpentine of Frazer's Island.
Tristania *conferta*. Brisbane Box.
Barklya *syringifolia*.
Castanospermum *australe*. Bean-tree.
Elæocarpus *grandis*. Quandong.
Tarrietia *actinophylla*. Stavewood.
Sterculia *discolor*. Currajong.
Diploglottis *Cunninghamii*. Tamarind.
Harpullia *pendula*. Tulipwood.
Rhus *rhodanthema*. Deep or Dark Yellow-wood.
Baloghia *lucida*. Scrub Bloodwood.

TREES OF MEDIUM OR SMALL SIZE.

Tropical.

Brassaia *actinophylla*. Umbrella-tree.
Spondias *pleiogyne*. Burdekin Plum.
Wormia *alata*.
Lagunaria *Patersoni*.
Thespesia *populnea*.
Pongamia *glabra*.
Bauhinia *Hookeri*. Ebony.
Davidsonia *pruriens*. Davidson's Plum.

TREES OF MEDIUM OR SMALL SIZE (*Tropical*)—continued:

Eucalyptus Staigeriana. Lemon-scented Ironbark.

Xanthostemon chrysantha.

Graptophyllum Earlii.

Eremophila bignoniæflora. Sandalwood.

Buckinghamia celsissima.

Licuala Muelleri. Cardwell Fan Palm.

Archontophoenix Alexandræ. Palm.

Extratropical.

Livistona australis. Cabbage-tree Palm.

Macrozamia Hopei.

Casuarina inophloia. Thready-barked Oak.

Hymenosporum flavum.

Bosistoa sapindiformis. Towra.

Geijera Muelleri.

Atalaya hemiglauca. Cattle-bush.

Erythrina vespertilio. Cork-tree.

Callistemon lanceolatus. Bottle-brush.

Litsea dealbata.

Stenocarpus sinuatus. Tulip-flower.

SHRUBS.

Tropical.

Fenzlia obtusa.

Tournefortia sarmentosa.

Clerodendron Cunninghamii.

Cassia magnifolia.

Elæagnus latifolia.

Gastrolobium grandiflorum. Poison-bush.

Extratropical.

Bacularia monostachya. Walking-stick Palm.

Doryanthes excelsa, var. Palmeri. Giant Lily.

Drimys dipetala. Pepper-tree.

Eupomatia laurina.

Hovea acutifolia.

Acacia podalyriæfolia. Silver Wattle.

Argophyllum Lejourdanii.

Myrtus tenuifolia.

Eremophila maculata. Native Fuchsia.

CLIMBERS.

Tropical.

Hoya Nicholsoniæ. Yellow-blossomed Wax-flower.

Hausmannia jucunda.

Faradaya splendida.

Nepenthes Kennedya. Pitcher-plant.

Bernaysii. Pitcher-plant.

Entada scandens. Match-box Bean.

Extratropical.

Melodorum Leichhardtii.

Capparis sarmentosa.

Millettia megasperma.

CLIMBERS (*Extra-tropical*)—continued :

Hardenbergia monophylla.
 Kennedya rubicunda.
 Lonchocarpus Blackii.
 Hoya australis. Wax-flower.
 Jasminum simplicifolium.
 Ipomœa palmata. Convolvulus.
 Tecoma Hillii.
 jasminoides.
 Piper novæ-hollandiæ. Pepper.
 Vitis hypoglauca. Vine.

UNDERSHRUBS OR HERBACEOUS PLANTS.

Tropical.

Utricularia chrysantha.
 Bæa hygroskopica.
 Orthosiphon stamineus.
 Pimelia hæmatostachya.
 Curcuma australasica.

Extratropical.

Eupomatia Bennettii.
 Cheiranthus linearis.
 Tetratheca thymifolia.
 Melaleuca thymifolia.
 Pelargonium australe.
 Indigofera Baileyi.
 Gomphobium latifolium.
 Isotoma axillaris.
 Evolvulus alsinoides.
 Euphrasia scabra.
 Artanema fimbriatum.
 Blandfordia flammea.
 Xanthorrhæa macronema. Grass-tree.

AQUATIC PLANTS.

Tropical.

Nymphæa Lotus, var. Large White Water-Lily.
 Ottelia alismoides.
 Monochoria cyanea.
 Nelumbium speciosum. Large Pink Water-Lily.

Extratropical.

Nymphæa gigantea. Large Blue Water-Lily.
 Jussiaea repens.
 Limnanthemum crenatum.
 Ottelia ovalifolia.
 Utricularia flexuosa.

ORCHIDS, EPIPHYTAL.

Tropical.

Dendrobium bigibbum, var. Sumneri. Flowers purplish.
 undulatum. Flowers brownish-yellow.
 undulatum, var. Johannis. Flowers bronzed.

ORCHIDS, EPIPHYTAL (*Tropical*)—continued :

- Dendrobium speciosum fusiforme. Flowers white.
 Smilliæ. Flowers green and purple.
 Adæ. Flowers white, with very strong sweet scent.
 canaliculatum. Flowers white and purple.
 Bulbophyllum Baileyi.
 purpurascens. Flowers purple.
 Eria Fitzalani. Flowers white.

Extratropical.

- Oberonia palmicola. Flowers orange.
 Dendrobium speciosum, var. Hillii. Flowers white.
 monophyllum. Flowers yellow.
 linguiformis. Flowers white.
 teretifolium. Flowers white.
 tetragonum. Flowers white stained with purple.
 Cymbidium albuciflorum. Flowers greenish-yellow.
 Sarcochilus divitiflorus. Flowers bronzed.
 Hartmanni. Flowers white and purple.
 Galeola foliata. Flowers brownish.

ORCHIDS, TERRESTRIAL.

Tropical.

- Spathoglottis Paulinæ. Flowers rosy.
 Corymbis veratrifolia. Flowers white.

Extratropical.

- Phaius grandifolius. Flowers purplish.
 Calanthe veratrifolia. Flowers white.
 Dipodium punctatum. Flowers purplish.
 punctatum, var. Hamiltoniana. Flowers yellowish.

LYCOPODS.

Tropical Epiphytes.

- Lycopodium varium.
 phlegmaria.
 phlegmarioides.
 Psilotum complanatum.

Terrestrial.

- Lycopodium cernuum.
 Selaginella flabellata.
 Bakeriana.
 Belangeri.
 brisbanensis.
 australiensis.

FERNS.

Trees.

- Todea barbara.
 Cythea arachnoidea.
 Alsophila Robertsiana.
 Rebeccæ.
 Leichhardtiana.
 australis.
 Dicksonia Youngiæ.

FERNS—continued :

Epiphytal.

- Ophioglossum pendulum. Ribbon Adder's-tongue.
 Vittaria elongata. Grass-leaf Fern.
 Davallia pyxidata. Hare's-foot.
 Asplenium nidus. Bird's-nest.
 Platycerium grande. Stag's-horn.
 alcicorne, *var.* Hillii. Elk's-horn.
 Polypodium subauriculatum.

Climbing.

- Acrostichum sorbifolium, *var.* leptocarpum.
 scandens.
 Grammitis ampla.
 Lygodium japonicum. Snake Fern.
 scandens.
 Aspidium ramosum.

Scrub or River-side.

- Trichomanes johnstonense.
 Lindsæa incisa.
 Asplenium resectum, *var.* australiense.
 japonicum.
 Acrostichum neglectum.
 Adiantum formosum. Maidenhair.
 Aspidium confluens.
 Polypodium urophyllum.

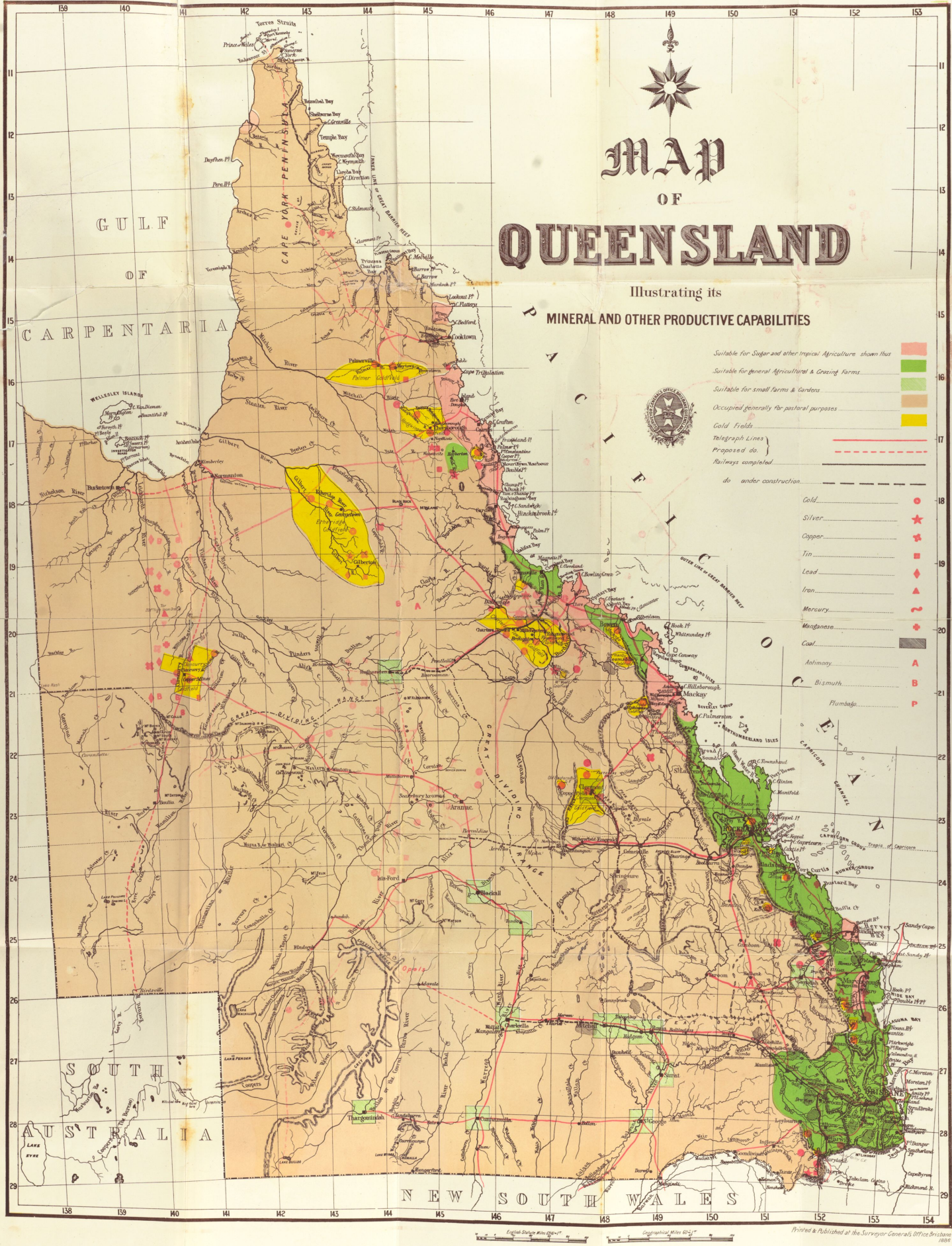
PLANTS THAT HAVE BECOME NATURALISED.

It will not be considered beyond the scope of this paper to note the various plants which have been naturalised ; for it is a well-known fact that whenever man opens up a new country he carries with him the vegetation of his native land. Many parts of Queensland have been found eminently suitable for the growth of foreign plants, which have become so luxuriant and wide-spread as to mislead those who have not taken special notice of the distinctive flora into believing them indigenous to the soil. Of course, some of these introductions have caused much trouble to the agriculturist, but of the weeds even it cannot be said of many that they are detrimental to the pasture. In enumerating the various plants it has been deemed sufficient to note only the scientific and trivial names :—

- Argemone mexicana, *Linn.* Infernal Fig.
 Nasturtium officinale, *R. Br.* Water Cress.
 Sisymbrium officinale, *Scop.*
 Senebiera didyma, *Pers.*
 Lepidium ruberale, *Linn.*
 Saponaria vaccaria, *Linn.* Cowherb.
 Lychnis githago, *Lam.* Corncockle.
 Silene gallica, *Linn.* French Catchfly.
 Stellaria media, *Linn.*
 Talinum patens, *Willd.*
 Modiola caroliniana, *Linn.* Carolina Mallow.
 Linum gallicum, *Linn.* Yellow Flax.

- Crotalaria alata*, *Hamilt.* Rattle-pod.
Lupinus hirsutus, *Linn.* Lupine.
Medicago denticulata, *Linn.*
 sativa, *Linn.* Lucerne.
Melilotus parviflora, *Desf.*
Trifolium repens, *Linn.* White Clover.
Arachis hypogæa, *Linn.* Earth-nut.
Vicia hirsuta, *Koch.* Hairy Tare.
 sativa, *Linn.* Vetch.
Phaseolus psoralioides, *W. et Arn.*
Cæsalpinia sepiaria, *Roxb.*
Cassia lævigata, *Willd.*
Mimosa pudica, *Linn.* Sensitive-plant.
Enothera biennis, *Linn.* Evening Primrose.
Passiflora edulis, *Sims.* Passion-fruit.
 alba, *Link and Otto.* White-flowered Passion-flower.
 fœtida, *Linn.* Love-in-a-mist Passion-flower.
 minima, *Jacq.* Minute-flowered Passion-flower.
Momordica balsamica, *Linn.* Balsam-apple.
 charantia.
Opuntia vulgaris, *Mill.* Prickly Pear.
Bupleurum rotundifolium, *Linn.* Hare's-ear.
Xanthium spinosum, *Linn.* Bathurst Burr.
 strumarium, *Linn.* Noogoora Burr. (In a young state this is
 dangerous to stock.)
Cryptostemma calendulacea, *R. Br.* Cape-weed.
Cnicus lanceolatus, *Linn.* Scotch Thistle of Queensland.
Centaurea solstitialis, *Linn.*
Silybum marianum, *Gærtn.* The Virgin Mary's Thistle.
Sonchus maritimus, *Linn.* Seaside Thistle.
Anagallis arvensis, *Linn.* Pimpernel.
Vinca rosea, *Linn.* Old Maid.
Asclepias curassavica, *Linn.* Redhead.
Lithospermum arvense, *Linn.* Corn Gromwell.
Ipomæa purpurea, *Roth.* Morning Glory.
 Quamoclit, *Linn.*
Cuscuta europæa, *Linn.* Dodder.
Lycopersicum esculentum, *Mill.* Love-apple.
Solanum pseudo-capsicum, *Linn.* Winter Cherry.
 auriculatum, *Ait.*
 aculeatissimum, *Jacquín.*
 sodomæum, *Linn.*
 pyracanthum, *Lam.*
 aculeastrum, *Dunal.*
Physalis peruviana, *Linn.* Cape Gooseberry.
Capsicum frutescens, *Linn.* Red Pepper.
Nicandra physaloides, *Gærtn.*
Lycium europæum, *Linn.* Boxthorn.
Datura fastuosa, *Mill.* Proud Thorn-apple.
 stramonium, *Linn.* Thorn-apple.
Nicotiana glauca, *Grah.* Tree Tobacco.
 Tabacum, *Linn.* Tobacco.
Martynia diandra, *Linn.*
Sesamum indicum, *Linn.* Gingelly Oil plant. (Leaves used to
 stop diarrhœa.)

- Thunbergia alata*, *Boj.*
 fragrans, *Kæmig.*
Lantana camara, *Linn.*
 Sellowiana, *Link.*
Stachytarpheta jamaicensis, *Vahl.* Brazilian Tea.
Verbena bonariensis, *Linn.*
 venosa, *Gill.*
Salvia coccinea, *Linn.*
Brunella vulgaris, *Linn.* Common Self-heal.
Marrubium vulgare, *Linn.* Horehound.
Stachys arvensis, *Linn.* Hedge Nettle.
Moluccella spinosa, *Linn.* Molucca Balm.
Plantago major, *Linn.* Plantain.
 lanceolata, *Linn.* Rib-grass.
Amarantus spinosus, *Linn.*
Boussingaultia baselloides, *H.B. and K.* Lamb's-tails.
Rivina lævis, *Linn.*
Phytolacca decandra, *Linn.* Red Ink plant.
 octandra, *Linn.* American Poke.
Polygonum aviculare, *Linn.* Wire-weed or Knot-grass.
Rumex acetosella, *Linn.* Small Sorrel.
Euphorbia peplus, *Willd.*
Ricinus communis, *Linn.* Castor-oil plant.
Urtica urens, *Linn.* English Nettle.
Panicum teneriffæ, *var. rosea.* Natal-grass.
Coix lachryma, *Linn.* Job's-tears.
Euchlæna luxurians, *Asch.* Teosinte. (This and the next can
 hardly be called naturalised, although met with as strays
 from culture.)
Zea Mays, *Linn.* Maize.
Holcus lanatus, *Linn.* Soft-grass.
Avena fatua, *Linn.* Wild Oat.
Dactylis glomerata, *Linn.* Cocksfoot.
Poa annua, *Linn.*
 pratensis, *Linn.* Meadow-grass.
Bromus sterilis, *Linn.*
 unioloides, *H. B. and K.* Prairie-grass.
Lolium perenne, *Linn.* Rye-grass.
 temulentum, *Linn.* Darnel.
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MAP OF QUEENSLAND

Illustrating its
MINERAL AND OTHER PRODUCTIVE CAPABILITIES

- Suitable for Sugar and other tropical Agriculture shown thus
- Suitable for general Agricultural & Grazing Farms
- Suitable for small Farms & Gardens
- Occupied generally for pastoral purposes
- Gold Fields
- Telegraph Lines
- Proposed do
- Railways completed
- do under construction

- Gold
- Silver
- Copper
- Tin
- Lead
- Iron
- Mercury
- Manganese
- Coal
- Asimony
- Bismuth



NEW SOUTH WALES

COLONIAL & INDIAN EXHIBITION OF 1886

BY AUTHORITY OF THE EXECUTIVE COMMISSIONERS IN QUEENSLAND.



HANDBOOK OF QUEENSLAND GEOLOGY

BY

ROBERT L. JACK, F.G.S., F.R.G.S.,

GOVERNMENT GEOLOGICAL SURVEYOR.

BRISBANE:

WARWICK AND SAPSFORD, PRINTERS AND LITHOGRAPHERS, EAGLE STREET.
1886

PREFACE.

THE following pages, written at the invitation of the Executive Commissioners in Queensland, are intended to serve as a guide to the Geological Map on the scale of 16 Miles to an inch, forwarded to the Colonial and Indian Exhibition of 1886.

The labours of Aplin, Daintree, Gregory, and Rands have furnished copious details bearing on the geology of the colony. My own efforts have been directed, during the last eight years, to a Geological Survey. This work could not possibly be carried on systematically by the methods in use among the geological surveys of older countries. The vast extent of the colony, the long periods of drought, the difficulties of internal communication, and the hostility of the natives, must be taken into account in estimating the value of the results achieved by my predecessors and myself. The two last evils, however, are decreasing year by year, with the extension of railways and the progress of settlement. For example, the York Peninsula, where, in 1879, my companions and I left the northernmost camp of our countrymen, on the McIvor River, to see them no more till we had run the gauntlet of several tribes of blacks (a horse having been killed under me, and a spear driven through my neck), and reached the settlement at Somerset, is now covered with squatting runs, while a telegraph line is being laid to connect Cooktown with Somerset.

It is fair to say that urgently-required field-work prevented my beginning this hand-book till the time allowed by the Commissioners for its completion was well nigh exhausted. To the shortness of the time must be attributed many of the inaccuracies inseparable from "raw haste." In fairness to the draughtsman (Mr. Gustav von Wehrs) it must also be said that when I put the map in his hands there was no time for such an artistic reproduction of it as would have been satisfactory to himself.

I must acknowledge my deep obligations to Mr. Robert Etheridge, junior, of the Natural History Department, British Museum, formerly of the Geological Survey of Victoria, and afterwards my

colleague on the Geological Survey of Scotland, for the unwearied kindness with which he has, ever since my arrival in Queensland, assisted me, by preparing and determining my palaeontological collection. To Professor H. A. Nicholson, D. Sc., Ph. D., &c., of the University of Aberdeen, William Carruthers, Esq., F.R.S., V.P.G.S., &c., Keeper of Botany, British Museum, Sir I. William Dawson, C.M.G., F.R.S., &c., Principal of McGill University, Montreal, and Dr. Henry Woodward, F.R.S., &c., Keeper of Geology at the British Museum, I am indebted for similar assistance.

In addition to the writings of my predecessors in the Geological Survey (drawn for the occasion from the limbo of official reports), and of my present colleague, Mr. W. H. Rands, A.R.S.M., F.G.S., I have to acknowledge my obligations to the works of the Rev. W. B. Clarke, Charles Moore, Esq., F.G.S., Robert Etheridge, senior, Esq., F.R.S., the Rev. J. E. Tenison-Woods, F.G.S., F.L.S., Norman Taylor, Esq., formerly of the Geological Survey of Victoria (the latter of whom has kindly favoured me with the use of his valuable notes on Hann's Exploring Expedition in Cape York Peninsula). Messrs. Leichhardt, Macgillivray, Byerley, Jardine, Hodgkinson, Mulligan, Dalrymple, and a host of others. One aim of the present volume is to form a sort of bibliography or index to the literature of the subject with which it deals.

Collections of fossils and specimens which must materially aid in the unravelling of the geological structure of Queensland have been presented to me by Mr. James Smith, of Rockhampton, Mr. R. C. Ringrose, of Charters Towers, and many other gentlemen.

R. L. J.

Geological Survey Office,
Townsville, 18th February, 1886.

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INTRODUCTION.

THE eastern third of Queensland is the remnant of a lofty table-land, composed of hard materials, which have resisted denudation, and culminates, at an elevation of 5,438 feet, in Mount Bartle Frere. This table-land is the chief seat of the mineral wealth of the colony. The table-lands end in a series of escarpments, or in a short and steep slope down to the Pacific Ocean, or its raised beaches. This elevated tract generally robs the rain-charged clouds which rise up from the Pacific, and a fairly watered and well timbered country is the result. The generally indifferent character of the soil accounts for the fact that the grasses, though fair, are not first-rate for pastoral purposes. Where, however, basaltic plateaux occur, agricultural soils of the highest quality are produced. These are often covered by dense tropical jungles, and give rise to copious streams of perennially running water. The falls of the Barron River are probably unequalled in picturesqueness. At present almost inaccessible, they will in a few years (on the completion of the Herberton railway) be admired by crowds of the lovers of nature.

Besides granites, partly of plutonic, and partly of metamorphic origin, this coast region presents a series of stratified rocks, of which the older members are more or less metamorphosed. Of newer dates, and recognisable by their fossil contents, and their relations to one-another, are formations related homotaxially to the Devonian, Carboniferous, Permian, Jurassic, Cretaceous, and Tertiary rocks of Europe, igneous rocks of various ages and recent formations.

The western interior presents a totally different aspect. The table-land slopes gradually westward, and falls away towards the Gulf of Carpentaria, and the south-western boundaries of the colony. The greater part of the interior is covered with soft stratified rocks of cretaceous age, which weather into a fine soil, supporting nutritious grasses, but almost treeless. The rainfall over this region is, however, comparatively small, and the water-courses are ill-defined, and dried up to water-holes during the greater part of the year. At

intervals, portions of the interior are covered with detached tablelands of what has been aptly named "Desert Sandstone," supporting, as a rule, only spinifex grass and stunted timber. The evidences that this formation once covered the whole of the western interior are unmistakeable, and it is matter for congratulation that it has been so extensively denuded as to lay bare, over an immense area, the rich soil-producing cretaceous rocks. Between the Desert Sandstone and the recent deposits, is a series of drift-deposits, containing the remains of gigantic extinct marsupials.

In the following chapters, the various formations which tell a part of the geological history of the colony, will be described in such detail as the limits of the work will permit.

CHAPTER I.

SLATES, SCHISTS, GNEISSES, &c.

(AGE UNDETERMINED.)

It will be seen from the map, that a vast area of the loftiest ranges of the colony, extending from the boundary of New South Wales along the eastern side of Queensland, northward to Lloyd's Bay, is composed of schists, slates, gneisses, &c. These stratified rocks are capable of numerous subdivisions, which can only be indicated at present. The time has not yet arrived for a complete unravelling of the complex structure of this series of formations. The geologist often sighs for the simplicity of ancient geological methods, which would permit him to mass as "azoic" everything which has not yet yielded evidences of life, and is assailed by the temptation to assign horizons to the fossiliferous localities in accordance with the proportions of European types furnished by them. But it is soon found that no classification based on this principle will hold good for any large area. The strata, consisting originally of limestones, conglomerates, siliceous, and felspathic sandstones, clay shales and mudstones, are generally thrown into sharp folds, and are often locally metamorphosed into marbles, quartzites, greywackes, mica, and talc schists, Lydian stone, &c.; or, still further, to the utter obliteration of their originally stratified character, into serpentines, diorites, hornblende and tourmaline—gneisses, porphyries, granites, &c.

The granites and syenites of Charters Towers appear to be the ultimate stage in the metamorphism of the series of stratified rocks described on page 15 of my report "On the Geology and Mineral Resources of the District between Charters Towers Goldfield and the Coast." (Brisbane: By Authority, 1879.)

These rocks are older than the Burdekin beds. They are all metamorphosed in a greater or less degree. The metamorphism must have taken place prior to the deposition of the Burdekin beds, pebbles and granules of the metamorphosed rocks forming the material of which the conglomerates of the latter series are built up.

These once horizontal beds are now thrown into broad folds, and probably do not occupy more than one-fourth of the surface over which they were deposited. The stratified rocks occur to the north and west of Charters Towers. They consist of quartzites, slates, and shales. The slates do not differ from the shales in mineral composition—mainly silicate of alumina, with a high percentage of peroxide of iron—but simply in being intersected by cleavage-planes. Both the slates and the greywackes are, as a rule, highly impregnated with iron, being in places "iron-masked" to such a degree that they might almost be taken for weathered clay-band ironstones. Occasionally, where the greywackes are fresh and contain little iron, they somewhat

resemble blue limestone, while their joint-surfaces are often coated with calc-spar. A conglomerate of small quartz-pebbles, enclosed in a matrix of fine sandstone (mainly of felspathic materials), coloured dark red with peroxide of iron, is met with in two places between Charters Towers and the Burdekin.

In these stratified rocks no fossils have as yet been detected. Mr. R. Etheridge, senior, states* that the Broken River limestones ("Burdekin Beds") which he calls "Siluro-Devonian," are the lowest fossiliferous rocks in Queensland. But the latter beds are undoubtedly of much more recent date than the rocks last above described. The Rev. W. B. Clarke (erroneously, I think) ascribes to Mr. Etheridge the view that "nothing lower than Siluro-Devonian has been found in Queensland." No older *fossils* have been discovered, but lower and older stratified rocks most certainly have.

The Band of Hope, Rose, Shamrock and Thistle, and Great Britain, auriferous Reefs lie in this area.

Over an extensive area in the STAR district stratified rocks older than the Burdekin Beds have suffered a high degree of metamorphism. Their dip and strike are still recognizable, although a state of semi-fusion and plasticity which has supervened has permitted of the partial re-arrangement and crystallization of their component minerals.

A very coarse quartzite grit or fine conglomerate is seen in Cattle Creek near its junction with Keelbottom River. On the hill North of this a felspathic slate appears to pass gradually into a pale yellow elvan or felstone. There is reason to believe that the slate is of volcanic origin (a fine tuff). Before Cattle Creek emerges from the hills to the North of the Star Road, it exposes sections of slates, greywackes, and coarse quartz conglomerates. On the Star Road, a mile west of Keelbottom crossing, a soft mica-schist occurs, traversed by numerous veinlets of quartz. Similar schists, together with quartzose grits, occur on the western head of Cattle Creek. A region of quartzose micaceous schists is traversed by the creek falling into the Little Star River below the Etheridge Road.

The mountainous region whence Melon, Scrubby, and Dinner Creeks, and the north head of Cattle Creek, take their rise, is composed of hornblendic schists and gneisses, with some quartzite beds. From this locality must have been derived the gold found in the alluvial deposits of these creeks, where they emerge from the hills.

Prepared slices of the gneiss of Dinner Creek, examined under the microscope, show that the rock is essentially composed, in about equal proportions, of hornblende crystals (generally passing on the edges into the condition of viridite) and blebs of quartz, with rare crystals of plagioclase felspar, the whole being, so to speak, "peppered" with minute opaque specks of magnetic iron. Sometimes cubical specks of iron pyrites are visible to the naked eye.

* Quarterly Journal of the Geological Society of London, vol. 28, p. 384.

Occasionally beds of shales, &c., appear to have been baked, shattered and re-cemented in the form of hard breccias of Lydian stone, jasper, &c. Examples of this phenomenon are to be seen in the Round Mountain (East of Mount Frederick), and in the hills east of "The Springs" in Speed Valley.

On referring to the map accompanying my Report on the District between Charters Towers and the Coast it will be seen that there is no regularity either in the dip or strike of the schists, &c., of the Star District. There is evidence of a very considerable degree of disturbance from forces exerted in various directions, and probably at different times. All that can be said with certainty is, that both the metamorphism and the disturbance had been effected before the deposition of the "Star Beds," afterwards to be described.

Over the whole of the metamorphic area of the Star (not the "Star Beds" proper), quartz reefs are numerous, and the soil is strewn with quartz fragments. None of the reefs, however, appear to have been successfully worked for gold, in spite of the presence of alluvial gold in the gullies.

In this region there has recently been discovered an extensive series of lodes, containing lead oxides, carbonates, sulphates, and galena, all yielding a high percentage of silver. The silver mines will probably soon rise to importance. Among these rocks of undetermined age may in the meantime be included:—

(1) The DRY RIVER SILVER MINING DISTRICT (Newelltown, near Herberton). The country is greywacke and slate (the latter sometimes black), nearly vertical, with a north and south strike. In Spring Creek is a bed of blue limestone showing on weathered surfaces traces of coralline structure. The mines are described in my report on the "Tin Mines of Herberton, Western and Thompson's Creek Districts, and the Silver Mines of the Dry River." (Brisbane: By Authority, 1883.)

The *Try-no-More Lode* runs west 30 deg. north, and underlies south 30 deg. west. The prospecting claim has three lodes, one of which is the continuation of the *Try-no-More*. *McFadden's* or *Paddy's Lode* runs west 15 deg. north, and underlies slightly to south 15 deg. west.

The *Silver Streak* is worked on a continuation of *McFadden's*, and another lode occurs in the claim running south 30 deg. east.

The *Target* runs east 10 deg. south, with an underlie at 60 deg. to south 10 deg. west. The *Silver Valley* runs south and south-east. The *Target No. 1 East* runs east 10 deg. south, and underlies south 10 deg. west. The *Caledonian* runs west-north-west. The *White Star* runs west 30 deg. north, and underlies south 30 deg. west. The *Rainbow* runs north-west, and underlies slightly to south-west. The ores of *McFadden's*, the *Silver Streak*, the *Silver Valley*, the *Caledonian*, the *White Star*, and the *Rainbow* are chiefly galena. In the *Try-no-More* the ore is a very complex one—copper-pyrites and steel-grey marcasite, galena, and zinc-blende in a quartz

matrix. In the Prospecting Claim, the cap of the continuation of the Try-no-More, is a red ferruginous gossan, with carbonate of copper and a gangue of slaty breccia. The cap of another lode protrudes 10 or 12 feet above the surface, and consists of red "tile ore" and green and blue carbonates of copper. A third lode on which a shaft had been sunk 55 feet at the date of my visit (Nov. 1882) had a gossan containing green carbonate of copper. The copper ores appeared to be giving place to zinc-blende and galena, with pyrites, as far as I could see down the shaft. Dennis' Tunnel Claim had a red ferruginous gossan with galena and carbonate of copper. Short's claim had a cap of red gossan showing large lumps of galena, some blocks reduced by decomposition to sulphates and carbonates of lead surrounding small *nuclei* of galena. The Target contained yellow oxide and grey carbonate of lead and galena, and is said to have yielded also some argentite (sulphuret of silver).

In all of the above mines the lead ores yield on assay a proportion of silver, which will prove highly remunerative when the mines are connected by railway with the coast.

(2) The slates, &c., which form a narrow belt between the granite of Watsonville and the stanniferous porphyry of the range to the south. In this belt are a number of mines in which copper and tin ores are intimately associated. Among these are the Wyatt, Shaughraun, North Australian, Good Friday, Grand Secret, Ironclad, Crucible, Ulster, and Come-by-Chance.

The *Wyatt* claim is in a country of greywackes and shales, which dip at a low angle to the south-west. The greywackes, as seen in a cutting on the right bank of Jamie's Creek, are somewhat impregnated with green carbonate of copper; and a thickness of about 4 feet of shales has been pretty nearly replaced by green and blue carbonate of copper. A little way up the hill is a shaft, 25 feet deep, reaching to the same level as the bottom of this cutting, but not connected with it. From the bottom of this shaft massive copper pyrites was obtained.

The *Shaughraun* adjoins the Wyatt further up the Creek. The copper ore occurs among the bedding-planes of hard fine-grained quartzose greywackes and micaceous shales, which dip to the south-west at 15 degs. The ore is mainly "tile ore" (ferruginous red oxide of copper), iron ochre, and red and blue carbonate of copper, with some lumps of pretty pure red oxide of copper. A little tin ore is said to be mixed with the copper ore.

The *North Australian* lies to the east of the Shaughraun, in greywacke and shale country, which dips at 35 degs. to the south-west. The tin ore occurs in "heads," or joints, at right angles to the dip of the greywackes and shales. The ore has a distinct character of its own. It is fine-grained, grey and friable, but occasionally finely crystalline on faces. The grey colour results from the presence of steatite in the interstices between the particles of ore. The "blow" or outcrop, when first discovered, stood several feet above the ground,

and the ore has been worked in an opencast 10 or 20 feet wide and extending about 50 feet north-north-west to south-south-east. About £50,000 worth of ore has been produced from this mine up to the end of 1885.

The *Good Friday* lies on the south side of Jamie's Creek, in hard greywacke and jasperised clay-slate country. It underlies to east 40 degs. north at an angle of 70 degs. It was worked opencast for about 100 feet. At the south-east end of the cutting a vertical shaft strikes the lode at 40 feet and follows a shoot of ore for about 30 feet to the south-east. This shoot of tin ore, whose section averaged 8 feet square, underlay at 45 degs. to the south-east, till, at a shaft 60 feet from the north-west end of the cutting it was about 30 feet deep. At the shaft it was somewhat deflected, and extended horizontally to the 40 feet shaft above referred to. The ore is in large blocks, massive and pure, sometimes consisting of aggregates of minute crystals, and associated with brecciform masses of steatite and noble serpentine.

The *Grand Secret* is on the opposite side of the gully from the Good Friday. In a shaft 47 feet deep, tin ore was found all the way down, on a foot wall which underlay a little to the north-east. At the bottom of the shaft the ore is seen, sometimes in lumps of considerable purity, with only a slight admixture of quartz. Oftener the ore occurs loose in a soft ferruginous matrix.

A tunnel on the claim is crossed by a narrow dyke of soft elvan, decomposing to kaolin, and sparingly containing fine crystals of tin ore. The greywacke adjoining the elvan contains a little tin ore.

The *Ironclad* adjoins the North Australian to the north-east, but differs widely from it in its characteristics. Near the southern end of the claim is the "copper shaft." It was sunk on a deposit of carbonate of copper and ochres, which ran mainly east and west, and underlay to the south in alternating shale and greywacke country. In the latter the deposit was contracted, and in the former it was wide and diffuse. About 70 feet up the hill, to the north, another lode is seen. Its cap was red gossan and carbonate of copper. This lode was followed in labyrinthine open-cast and other workings till it communicated with the "copper shaft" at a depth of 30 feet. Shortly below the cap the copper ore began to be intimately and extensively mixed with tin ore in small grains. The outcrops of two other strong lodes of copper carbonates are seen on the property.

The *Crucible* lies north of the North Australian, and west of the Ironclad. A shaft has been sunk on the bank of a gully intersecting the claim, on a lode running north, 30 deg. west. The cap contained tin ore, but immediately beneath the surface the tin ore was found to be mixed with carbonate of copper and copper pyrites. At 20 feet a level was driven 40 feet to south, 30 deg. east, and tin ore was found all the way. Below the level copper pyrites prevailed.

On the opposite side of the gully a tunnel strikes, and follows irregularly to the west, a belt of greywacke and shale country impreg-

nated with copper oxides and carbonates, in and adjacent to the bedding-planes.

A shaft was sunk 60 feet higher up the gully on a cap of red gossan and blue carbonate of copper. A large quantity of ore was raised—copper and iron oxides and green and blue carbonates. Some of it showed 13 per cent. of tin ore, although very little was visible. At 30 feet a level was driven 20 feet to east-south-east, and 60 feet to west-north-west, which appears to be the direction of the lode or cupriferous zone. In the west-north-west level the copper ore keeps pretty nearly in the bedding-planes, but near the end it appears to occur in a true lode, running west, and underlying slightly to the north. The east-south-east level contains much iron peroxide and not much copper ore.

In a 40-feet shaft, near the north corner of the claim, a little tin ore is seen among copper and iron ochre. The deposit appears to underlie to the east. A little to the west, in a shaft, the brittle greywacke and shale country on the top of a decomposing elvan dyke (running north-west and underlying at 70 deg. to south-west) is impregnated with tin ore.

In the *Ulster* claim is a north and south dyke of chlorite (altered diorite?) partly decomposed and disguised by peroxide of iron. The dyke contains quartz and tin ore. The country is very hard massive greywacke.

In the *Come-by-Chance* the only regular deposit of tin ore is one of about 15 inches wide, extending west-north-west, and underlying at 80 deg. to the north-north-east. A shallow shaft has been sunk on it. Elsewhere the tin ore occurs irregularly among the country rock, which is much altered greywacke, copiously veined with steatite, and graduating on the one hand into serpentine, and on the other into quartzite.

(3.) THE SILVER MINING DISTRICT OF IRVINE BANK.—Here lodes of galena, recently discovered in slate country, have already afforded a large yield of silver, and the mines are being rapidly developed. The Albion Mine has yielded also large quantities of horn silver (cerargyrite).

(4.) The table land of slates and schists, crossed on the road from Kingsborough to Port Douglas, and extending north-eastward from Anderson's homestead to the coast; and probably a large area of similar rocks extending along the seaboard to north and south.

(5.) The Silver-Lead Mining District of the SELLHEIM RIVER, and Charlie's Creek (a tributary of the Suttor), with the alluvial gold diggings of the head of the Suttor. In the year 1884 120 tons of ore, valued at £2,400, were shipped from the Sellheim River.

In 1885, according to Mr. G. P. Storey, the following quantities were sent from the Sellheim District:—

						TONS.
Pyramid Lode	...	...	...	...	...	166
Bonny Dundee	...	...	...	...	...	50
Birthday Gift	...	...	...	...	...	17
Porphyry Creek	...	...	...	...	...	3
General Gordon	...	...	...	...	...	6
Sunrise	...	...	...	...	...	3
Other Lodes at Pyramid	...	...	...	...	...	20
Do. Bonny Dundee	...	...	...	...	...	10
Argentine	...	...	...	...	...	3
						278

(6) The slate and schistose country, containing argentiferous lead lodes, on the east side of the Bowen River Coalfield.

(7) The talc and mica schists and slates, of the CLERMONT DISTRICT, with their copper and gold mines.

Descriptions of the famous PEAK DOWNS COPPER LODE, and some of the auriferous reefs, will be found in Daintree's "General Report upon the Northern District." (Brisbane. By Authority. 1870.) My colleague, Mr. Rands, is at present making a geological survey of the district. The yield of gold from the Clermont field in 1884 was 275 ounces.

(8) THE NEBO OR MOUNT BRITTON GOLDFIELD, which yielded in 1884 to 19 reefers and 21 diggers 500 ounces of gold. This is about one-fourth of the yield of 1883, the decrease being attributed to the drought. The Warden refers, in the "Annual Report of the Department of Mines," to the finding of a 60-ounce nugget on Moonlight Creek.

(9) THE CAPE RIVER GOLDFIELD appears to belong to a series of rocks older than the oldest known fossiliferous rocks of Queensland. The field is thus described by Daintree:—*

"The auriferous area indicated by the term 'Cape River Diggings' would include a very large extent of country, if the continuity of the same rock-formation were a guarantee of equal mineral wealth throughout. Payable gold deposits have, however, up to the present time, been confined to the south-eastern outcrops of a vast thickness of schistose rocks developed on the Cape, the north-western extension of the same having failed to yield the precious metal in remunerative quantity to the projector.

"The approximate thickness of this auriferous series may be arrived at by assuming the mica-slates of Mount Devonport to represent the base, and the schists of conglomerate gully the top, of a continuous system of strata, dipping south 25 degrees west, with an

* Report on the Cape River Diggings, and the latest mineral discoveries in Northern Queensland. Brisbane. By Authority. 1868.

average inclination of 45 degrees. The distance between these points would give a thickness of more than seven miles of solid rock, in the debris of all positions of which gold has been discovered.

"The extension on the surface of this vast body of rock-material may be easily followed from the south-eastern extremity of Mount Devonport, up to and beyond Mount Courtenay, until it disappears under the lava table-land west of the Walker River.

"No fossils have as yet been, or are likely to be, found in these beds, on account of their metamorphic character throughout. The only assertion to be made in regard to their age is—that rocks of a similar character further north are unconformably overlaid by others containing abundance of upper silurian fossils. [Broken River: (Burdekin Beds.) R. L. J.]

"The entire series may be subdivided into characteristic upper, middle, and lower groups.

"*Upper.*—The upper is distinguished by the hardness of the material of which it is composed. The Barrier Range, forming the watershed between the Cape and Rankin's Mistake Creek, is a monument of the durability of its quartzites and silicified mica-slates, single bands of which can be traced for miles along the course of the range, becoming marked features in the landscape. The higher points of this ridge are elevated fully 1,000 feet above the bed of the Cape River, and 2,600 feet above the level of the sea.

"Moran's, Green's, Long's, Golden and Nuggety Gullies, all traverse these rugged quartzites, and the ravines yielding payable gold, about three miles west from the Black Mountain, have their sources in the westerly extension of the same rocks.

"*Middle.*—The middle is in direct contrast to the above described, in regard to the durability of its rock constituents, except where traversed by extensive dykes, as at and around Mount Remarkable. It has yielded easily to the action of the elements, and the alluvial deposits of the Cape River owe their thickness and extent to this cause.

"Soft thin-bedded mica-slates, with occasional bands of silicified mica and hornblende schists, from the low undulating ridges through which the southern tributaries of the Upper Cape take their course.

"Specimen Gully and its branches have hitherto been the only attraction of the miner throughout its entire extent.

"*Lower.*—In the lower subdivision, laminated granite, mica, and hornblende slates are interstratified, and it is in this portion of the series that transmutation of the schistose rocks is most marked; indeed, near the junction of the schistose and granite rocks, so great has been the alteration that it is difficult to say where the schists end and the granite commences.

"The Upper and Lower Cape Diggings, Chinaman's Gully, &c., are situated within the limits of this lower group; the reef on Mount Devonport at its very base."

(10.) THE GILBERT AND WOOLGAR GOLDFIELDS are in rocks of a character similar to those of the Cape River.* Bismuth-carbonates and argentiferous galena are found in the Gilbert Goldfield. The Woolgar produced in 1884, 1796 ounces of gold from 1734 tons of stone.

(11.) THE CROYDON GOLDFIELD, between Georgetown and Normanston, has only been discovered within the last few months. Now that the summer rains have set in, and water is plentiful, a formidable "rush" has taken place. From a report by Mr. W. Samwell, Goldfield Warden, to the Mines Department, 14th December, 1884 (*Queenslander*, January 9th, 1885), the following description is taken:—

"The centre of the present mining operations is located in an undulating flat, running out from the broken ridgy country, between ridges and hillocks, into the plain or low-level forest country, which stretches away towards the shores of the Gulf. This flat has alternate layers of clay and heavy sand on its surface, and bands of granite, sandstone, conglomerate and auriferous quartz traverse it in all directions. The geological features of the district appear to be about the same as the Etheridge Goldfield—the country right away south, by the heads of the Norman River, to about abreast of the Woolgar, being but a continuation of the Etheridge, Gilbert and Woolgar auriferous country. This country runs out to the north-west in long spurs, broken ridges, and chains of isolated hills, feathering away, it may be said, in the low-level forest and lake country, extending from the foot of the hills—"once foreshores of the sea"—on to the present mangrove-fringed salt-pan shores of the Gulf of Carpentaria."

In a newspaper report recently published it is stated that Messrs. L. Davis & Co., Brisbane, have made the following assays of quartz from Croydon:—

		ozs.	dwts.	grs.	
(1) Iguana Reef	...	6	10	16	to the ton.
(2) Better Luck	...	21	4	16	"
(3) Lady Mary, No. 1	...	13	1	8	"
(4) Do.	...	8	3	8	"
(5) Caledonian	...	13	1	8	"

(12.) THE CLONCURRY DISTRICT.—In this region a large area is covered by highly-inclined slates, quartzites, and greywackes, with occasional crystalline limestones—unfossiliferous, so far as I have seen, with the exception of a doubtful fossil at Mount Euri. A pretty full description of the copper and gold mines will be found in my "Report on the Geological Features of Part of the District to be Traversed by the Proposed Transcontinental Railway" (Brisbane: By Authority, 1885). Mr. W. O. Hodgkinson and E. A. Kayser in Official Reports dated 1876 (Brisbane: By Authority), give exhaustive accounts on the same subject.

* See Daintree's "Report on the Gold Discoveries in the Gilbert Ranges: Brisbane," by Authority, 1869, and his paper on the Geology of Queensland (*Quarterly Journal Geol. Society*, London, vol. 28, p. 271).

Towards the Mount Douglas Gold Mines the country is studded with peculiar rugged knobs of granular quartzite, which I suspect represent the discharge pipes of geysers. The most striking features of the country, however, are mountains of pure specular and magnetic iron ore. One of these, Mount Leviathan, is about 200 feet high and a quarter of a mile in diameter at its base. Another, Mount Pisa, forms a remarkable leaning peak, overlooking the Great Australian Copper Mine.

The Great Australian and the Argylla seemed destined to rank among the most important of copper-producing mines, when railway communication with the coast shall have made their remunerative working possible. Both have enormous quantities of very rich ores (red oxides and green carbonates) with a good deal of native copper. Besides the cluster grouped around the township, important copper mines occur at Pumpkin Gully, Mount Norma, the Dugald River, Duck Creek, Sunday Creek, Dobbins Creek, &c. A very long lode of iron and lead ores—the latter containing silver—occurs on the Dugald.

Gold occurs in the alluvial wash of Pumpkin Gully, associated with native bismuth. In the Uncle Tom reef, Pumpkin Gully, gold occurs in quartz, calcite and chalybite. The carbonates of copper in the Flying Dutchman and Homeward Bound Lodes contain a good deal of gold. The Gilded Rose mine, at the head of Fisher's Creek, among flaggy talcose sandstones and shales has yielded gold from pyrites for a number of years back. A reef on Weatherley Creek is said to give good returns.

At the "Top Camp" the country is of chloritic slate and greywacke, in nearly vertical beds, striking south-east and north-west. The slate forms bold features on the hill tops, often standing up in fantastic knobs. The stratified rocks are frequently pierced by enormous dykes or reefs of quartzite, which stand up in lofty walls on the crests of the mountains. Here in the Mary Douglas, and other reefs, a good deal of gold was got, associated with native bismuth. The Mary Douglas quartz is very peculiar, being coated with botryoidal and stalagmitic manes of glossy-black limonite. From the Mary Douglas Hill there radiate in all directions gullies and flats which have yielded alluvial gold extensively—at one time employing 400 men. All the gold was heavy and nuggetty. One nugget, found in Chinaman's Flat, weighing 28 lbs.

(13) NORMANBY GOLD FIELD.—The Normanby Range, near Bowen, consists almost entirely of tourmaline-porphyry, a compound of quartz (for the most part amorphous), black mica (sparsely), and large or black crystals of tourmaline or schorl. The whole rock is mixed up with minute crystals and streaks of iron pyrites, and streaks and veins of serpentine. Occasional specimens may be found showing a passage from greywacke to tourmaline-porphyry.

The principal reefs lie along a line running south $44\frac{1}{2}$ degs. east along the heads of the gullies draining the south-western side of the Normanby Range. A less important parallel line of reefs intersects

Hungry Gully and Green Creek, striking towards Oakey Creek on the north-west. The reefs on both lines invariably underlie to the north-east. The reefs were abandoned whenever the water-level was reached, as the gold could not be extracted from the "mundic." Specimens of mundic taken by me from the Welcome reef (pale iron pyrites and copper pyrites) assayed for 8 ozs. 9 dwts. 20 grs. of gold, and 1 oz. 12 dwts. 6 grs. of silver to the ton. The field is at present abandoned. *

CHAPTER II.

BURDEKIN BEDS.

To this group may be referred the limestones of the Clarke River, and its tributary, the Broken River, and the limestones of Burdekin Downs, Terrible (Arthur's) Creek, and the Reid Gap. These, as having yielded the majority of the fossils which have as yet been scientifically examined, may be regarded as the types of the formation. Mr. R. Etheridge, senr., in 1872, in his appendix to Mr. Daintree's paper, in the "Quarterly Journal of the Geological Society" (xxviii., p. 323), pronounced the Broken River beds "the lowest fossiliferous deposits in the Queensland area," and regarded them as "Lower Devonian, or Siluro-Devonian."

BROKEN RIVER—LIMESTONES.—The late Mr. R. Daintree observed ("Quarterly Journal of the Geological Society of London, vol. xxviii., p. 290"), "On the Broken River the entire Devonian system, as developed in Queensland, could be easily and satisfactorily mapped. The branches of this river cut right across the strike, and the bare edges of the rocks are often exposed over the intervening ridges from creek to creek. Well marked beds of interstratified conglomerates seem to retain their character over large areas. On the track from the Broken River to the Gilbert diggings, Devonian rocks several thousand feet thick may be observed, as they are continuous in dip without being repeated for at least 5 miles across the strike, with an average inclination of 60 degrees." Unfortunately I have never had an opportunity of visiting this interesting region.

The Broken River limestones have yielded the following fossils, as determined by Professor H. A. Nicholson, and Mr. R. Etheridge, junr., of the British Museum ("Annals and Magazine of Natural History," September, 1879.)

* See "Report on the Normanby and Marengo Goldfields. By Robert L. Jack, Brisbane. By Authority, 1879.

SPONGIDA (STROMATOPOROIDEA.)

Stromatopora.¹

¹ Occurs also in Arthur's Creek—very like Devonian species of Devon and Eifel.

CLASS ACTINOZOA.

GENUS FAVOSITES.

Favosites gothlandica, var. *Goldfussi*, Edwards and Haime.²

² Corresponds strikingly with that met with in Corniferous Limestone of North America.

Favosites gothlandica, Edwards and Haime.³

³ Closely resemble *F. epidermata*, from Corniferous Limestone.

GENUS HELIOLITES.

Heliolites porosa, Goldfuss.⁴

⁴ German and British Devonian rocks; also, Fanning, Arthur's Creek, and Burdekin Downs.

Heliolites Daintreei, Etheridge, junr., and Nicholson.*Heliolites*, sp. ind.*Heliolites plasmoporoides*, Etheridge, junr., and Nicholson.

BURDEKIN DOWNS AND FANNING LIMESTONE.—A bed, or rather series of beds, of limestone occurs on the Burdekin River, resting on granite, attains the remarkable thickness of 7000 feet before it is succeeded (conformably) by the sandstones, &c., afterwards to be described as the Dotswood Beds. Its outcrop forms a horse-shoe bend, which embraces a large tract of country between Dalrymple and Ravenswood Junction Railway Station.

From a collection forwarded by me Messrs Nicholson & Etheridge, Junior, have determined the following:—

SPONGIDA (STROMATOPOROIDEA).

Stromatopora. Arthur's Creek.⁵*Caunopora*.⁶ „

⁵ Like some of the Devonian species of Devon and Eifel. Occurs also at Broken River.

⁶ Species distinct from *C. placenta*, Phill, the characteristic Devonian form from Devonshire.

CLASS ACTINOZOA.

GENUS ALVEOLITES.

Alveolites (pachypora) sp. ind. Arthur's Creek.

„ sp. ind.

GENUS HELIOLITES.

Heliolites porosa. Goldfuss. Arthur's Creek and Fanning River, also, Reid River.

GENUS ARAEOPORA, Nicholson & Etheridge jr.

Araeopora australis. Burdekin River.

GENUS PACHYPORA.

Pachypora, sp. ind. Fanning River.⁷

⁷ Also Reid River.

GENUS TRACHYPORA.

Trachypora, sp. ind. Arthur's Creek.

GENUS AULOPORA.

Aulopora repens, Edwards & Haime. Arthur's Creek.

GENUS LITHOSTROTION OR LONSDALEIA.

Lithostrotion, (?) Arthur's Creek.

BRACHIOPODA.

GENUS SPIRIFERA.

Spirifera curvata.¹¹ Middle Devonian, Schlotheim (?) Fanning River.*Spirifera*, sp. ind. Fanning River.

GENUS ATRYPA.

Atrypa reticularis,² Linn. Fanning River.*A. desquamata*,³ Sow. Fanning River.² Upper Silurian and Devonian.³ Middle Devonian.

GENUS RHYNCHONELLA.

Rhynchonella, sp. ind. Fanning River.

GENUS ORTHOTETES.

Orthotetes Crenistria.⁴ Fanning River.⁴ Upper Devonian to uppermost Carboniferous.

REID GAP LIMESTONES.

About 30 miles from Townsville, on the Northern Line, the following strata are seen capping a hill on the western side of the railway :—

Hard sandstones and fine grained hardened sandstones (almost quartzites), with limestone in bands along bedding planes say ...	80ft.
Blue limestone (base concealed by talus); varying from dark blue limestone to white saccharine marble, say ...	60ft.

On the eastern side of the railway another hill top is capped by :—

Hardened white sandstone; a quartzite, partly conglomeratic ...	3ft.
Sandstone; thickness uncertain; blue coralline limestone, say ...	30ft.

On the hill tops, west of the railway at Double Barrel Creek, the following section is seen :—

Dark blue limestone, full of corals; the lower part only divided by partings of quartzite, at least ...	200ft.
Alternate quartzite, limestone, and marble bands, say ...	100ft.
Blue greywacke ...	1½ft.
Alternate quartzite and limestone bands ...	40ft.
Dark blue greywacke ...	5ft.
Scrub, perhaps covering ...	20ft.
Limestone, with quartzite bands ...	40ft.
Fine grained dark blue greywacke ...	4ft.
Impure saccharine marble, with dark streaks ...	15ft.
Dark blue coralline limestone, about*... ..	60ft.

* "Geological Features of Part of the Coast Range between Dalrymple and Charters Towers Roads." By R. L. Jack, Brisbane: By Authority, 1879.

These strata rest uncomformably on greywackes, &c., probably of the same age as the stratified rocks west of Charters Towers, among which are interstratified some thick beds of brecciated volcanic ash.

The Reid limestones are now extensively quarried for mortar, which is made use of principally in Townsville. They are well adapted for building stones, especially the white marble, which the Bishop of Northern Queensland proposes to use in his Cathedral.

In 1883 I commissioned Mr. Eric Edelfelt to make a collection of fossils from the Reid limestones. The collection was sent to Mr. Robert Etheridge, junior, who kindly supplied me with the following list and notes (hitherto unpublished):—

GENUS HELIOLITES.

Heliolites porosa.¹ Goldfuss. sp. Regan's and Benwell's Quarries.

¹ "Would indicate a horizon in the Middle Devonian, as it is found in that of both South Devon and the Eifel."—R. E., JR.—Occurs also at Arthur's Creek and Fanning River.—R. L. J.

GENUS CYSTOPHYLLUM, Lonsdale.

Cystophyllum Americanum,² var. (nov.) australe.

² "A typical fossil of Hamilton Group of North America, which is Middle Devonian."—R. E., JR.

GENUS CAMPOPHYLLUM.

Campophyllum Gregorii, sp. nov. Regan's, Philp's, and Benwell's Quarries.

GENUS CYATHOPHYLLUM.

Cyathophyllum, sp. Regan's Quarry.

GENUS PACHYPORA.

Pachypora meridionalis. N. & E.

GENUS AULOPORA.

Aulopora, sp. Regan's and Philp's Quarries.

GENUS ALVEOLITES.

Alveolites alveolaris,³ de Koninck. Regan's and Benwell's Quarries.

³ *Alveolites alveolaris*, de Kon., and *Coénites expansus*, de Kon., indicate a relationship with the Yass beds of New South Wales.—R. E., JR.

Alveolites alveolaris, var. *Queenslandensis*, Etheridge and Foord. Regan's Quarry.

GENUS AMPLEXOPORA.

Amplexopora? *Koninckii*, Etheridge and Foord. Regan's Quarry.

GENUS COENITES.

Coénites, sp., like *C. expansus*, de Koninck. Regan's Quarry.

SPONGIDA (STROMATOPORIDEA.)

GENUS PACHYSTROMA, Nich. and Murie.

Pachystroma, sp. allied to *P. densum*, Nich. Regan's quarry.⁴

⁴ Corniferous Limestone of North America.

Of the fossils of the Burdekin group, some are new to science. Of the remainder, two (*Alveolites alveolaris*, de Kon., and *Coénites*

expansus, de Kon.) indicate a relationship with the Yass beds of New South Wales (classed as upper Silurian), but the great majority correspond more closely with the lower and middle Devonian of Europe and America.

With the Burdekin group may be classed:—

(1) A series of blue and grey slates and shales, around Mount Wyatt, containing the following fossils, presented by Mr. Daintree to the Melbourne Museum, and determined by Professor M'Coy (who regarded them as upper Silurian) as follows:—

Chonetes sarcinulata.

Orthis, allied to *O. rustica*.

Receptaculites.

Leptæna, sp. undet.

The "lepidodendron beds" rest on the upturned edges of the blue and grey slates and shales.* See page *postea*.

(2) The blue limestone of Marble Island, in the Northumberland Group, which appear to be very like the Reid limestones. It is extensively used for mortar in Brisbane.

(3) It is with considerable hesitation that I class, in the meantime, the greater part of the palæozoic rocks south of Marlborough as belonging to the Burdekin beds. It is quite likely that, among the highly inclined and much distributed rocks of this region, strata will yet be found separable, on account of their fossil contents, and their stratigraphical relations, from the rest, and of different ages. But fossiliferous limestones, apparently identical with the Burdekin beds, are so common in the whole region, that the attempt to separate them from the other strata, which, after all, present only the negative evidence of the absence of fossils, has proved hitherto a task beyond our powers. Attempts have been made in limited areas; but I do not think that sufficient evidence has as yet been accumulated to warrant the conclusions which have been drawn.

The rocks of this district mainly consist of micaceous talcose and chloritic schists, slates, argillaceous shales (sometimes locally altered to Lydian stone), quartzites, greywackes, sandstones, grits, conglomerates, and limestones.

Daintree refers to the occurrence of "casts of *Spirifer*" in Devonian slates and shales at Lucky Valley, and the head of the Rosenthal Creek.

My colleague, Mr. W. H. Rands, in his "Report on the Goldfields of Raglan, Calliope, Milton, &c.," (Brisbane: by Authority, 1885), announces the discovery of encrinites in a limestone at Mount Holly. From a limestone near Langmorn he obtained an *Aviculopecten* resem-

* General report upon the Northern district, by R. Daintree, Brisbane. By Authority. p. 7.

bling *A multiradiatus*. In a limestone at Three Moon Creek near Cania Goldfield he found—

Petraia or *Cyathophyllum*,
Terebratula,
Avicula,
Edmondia.

Collections of fossils from the limestones at Rockhampton, Raglan, Langmorn, Norton, Cania, Coonigal, &c., have been made by Mr. James Smith, of Rockhampton, and Mr. Rands, and are now in the hands of Mr. R. Etheridge, Junr., for determination.

In this region are the gold-fields of Morinish, Ridgeland, Black-fellow's Gully, part of Rosewood Goldfield, part of the Crocodile Goldfield, and the Goldfields of Raglan, Calliope, Cania, Nanango, Pikedale, Canal Creek, Thane's Creek, Talgai, and Lucky Valley. The following Reports, &c., may be referred to for descriptions of the above fields:—

Progress Report of the Government Geologist for South Queensland. Aplin. Brisbane: By Authority, 1869.

Report on the Auriferous Country of the Upper Condamine, embracing the Diggings at Talgai, Thane's Creek, Canal Creek, and Lucky Valley, by C. D'Oyley H. Aplin. Brisbane: By Authority, 1869.

Progress Report on a portion of the Rockhampton Mining District, by R. Daintree. Brisbane: By Authority, 1870.

Report on the Geology of part of the Districts of Wide Bay and Burnett, by A. C. Gregory. Brisbane: By Authority, 1875.

Geological Features of part of the South-Eastern District of Queensland, by A. C. Gregory. Brisbane: By Authority, 1879.

Raglan, Calliope, and Cania are minutely described by my colleague, Mr. Rands, in an Official Report. (Brisbane: By Authority, 1885.) Nanango is described by him in a Report not yet published. A good deal of information will be found in the Wardens' Reports, and the Annual Reports of the Department of Mines.

Copper lodes are found on the Dee River and at Pikedale. Antimony Sulphides have been extensively worked at Neerdie. Lodes of Binoxide of Manganese occur at Gladstone, but the market for this metal is too limited to encourage the working of the mines.

(4.) In this division I place, till the production of further evidence, the

HODGKINSON GOLDFIELD.

This Goldfield has been described in detail by the writer in a report to the Minister for Works and Mines (Brisbane: By Authority, 1884), accompanied by two maps.

The Range known as "The Granite," or "Hann's Table-Land," divides the goldfield from the slates and schists of the Coast range. It is possible that the same formation originally extended on both sides of the granite table-land. If so, the coastward portion has suffered metamorphism in a much greater degree than the inland portion. The latter unquestionably looks newer than the former, and if both

existed side by side, it is not easy to see how one escaped the metamorphism which the other underwent. The age of the coastward slates and schists, however, has not been settled, nor is likely to be without a more detailed examination than has yet been attempted. Let this question be settled how it may, the fact remains that the one region (very little metamorphosed, and presumably the newer, if there really be any difference) is rich in auriferous reefs, while the other (highly metamorphosed and presumably the older), though far from destitute of quartz reefs, contains but a trifling amount of gold.

The stratified rocks of the Hodgkinson vary in fineness from shales to conglomerates. At the one end of the series the shales consist of pure blue clay, sometimes (as for instance at the Rob Roy mine) blackened by carbonaceous matter. The clay is divided into thin plates or laminae by the planes which mark the pauses in the process of deposition. Slaty cleavage is not entirely unknown, but it is so rarely met with, and so uncertain in its direction, that it may be presumed that pressure of the sort which results in the production of cleavage has been very feebly exerted. Alternating with the shales are strata of greywacke, whose materials are essentially the same, but have not suffered comminution to the same extent. The greywackes bear to the shales the same relation which sand bears to mud. The component grains or granules are partly derived from a basic felspar and partly from a hornblendic rock. The feldspatho-hornblendic matrix contains minute flakes of mica and grains of quartz. The mica and quartz have apparently been derived from a pre-existing granite rock. According to the frequency and size of the quartz grains, the greywackes pass by fine gradations into grits and conglomerates. The latter, however, contain, in addition to quartz pebbles, pebbles of quartzite or hardened siliceous sandstone, porphyry, Lydian-stone, dark shale, and limestone.

By carefully noting the dip and strike of the strata wherever they appear at the surface in gully or hill-top, and laying down their degree and direction on the maps, a tolerably clear idea of the structure of the goldfield has been obtained. The different strata do not present such marked characteristics that they can be traced with confidence for long distances, although some of the conglomerates in Glen Mowbray have been followed for more than a mile. Conglomerates, however, are from their very nature—being the product of strong currents and powerful attrition—apt to be of very local occurrence.

Within the area embraced by the large map (the neighbourhood of Thornborough and Kingsborough), it will be seen that there is a marked connection between the geological structure and the physical features of the field. That this holds equally true of the outside districts, I have no doubt; but a study in detail of the whole district would have occupied too much time, and would imply the use of maps which do not exist, and could only be made with months of labour in the field.

By following the vermilion lines on the maps it will be seen that the strata strike on the whole from north-west to south-east, their

denuded edges coming to the surface in that direction. The dip is usually towards the north-east, and at a high angle approaching the vertical. But the lines denoting the outcrops of the strata, it will be seen, bend or "bag" southward along an axial line passing to the west of the township of Thornborough. It is impossible to estimate exactly the thickness of the series of strata to which the Hodgkinson Goldfield belongs, as neither top nor bottom has yet been detected, and, moreover, the apparent thickness may be exaggerated by unsuspected replications among the denuded beds, but a minimum thickness at least may be arrived at with some confidence by assuming that, allowing for replications, and even for possible faults, the average dip to the north-east is no more than 65 degrees. On this assumption a thickness of 4000 feet may be presumed for the strata cropping out between the vermilion line representing the horizon of the Amy More Mine and the north-east edge of the large scale map, as measured to the south-east of Kingsborough. Measuring downward from this same horizon at Peak "N," in the Mount M'Gann Range, south-west-ward to Mount Grant (a line where the apparent thickness is not affected by the bending or bagging above referred to) a further thickness of at least 17,000 feet of strata is met with.

The detailed "study in stratigraphy" which the preparation of the large scale map implies, has revealed nothing to suggest the idea of any break in the continuity of the deposition of the whole series of at least 21,000 feet of strata, unless it be the gathering at the head of Columbia Creek of a portion of the series which, at the mouth of Caledonia Creek, only five miles distant, measures (at 65 degrees of estimated average dip) about 10,000 feet, into a space which can contain (although the strata are vertical) no more than 1300 feet. But I am inclined to think that the phenomenon may be explained by a thinning out of the sediments towards the south-east, though possibly the effect may be aided by a fault having a down-throw to the north-east.

The nearly parallel valleys of Caledonia Creek (Glen Mowbray) and the Hodgkinson River are bounded on the right or north-eastern side by the Mount M'Gann Range, and on the opposite side by the Mount Robert Range. These ranges have had their trend determined indirectly by the forces which compressed the strata of the district from south-west to north-east, and threw them into long folds from south-east to north-west. After the strata had been compressed into nearly as small a compass as they would go into—i.e., till they became nearly vertical—the further operation of the same pressure resulted in the formation of fissures along lines of weakness; which lines of weakness were found in the bedding planes dividing the upturned strata from one another. These fissures, which are nearly, but not exactly, parallel with the outcrops of the strata, have been filled with a rock of great hardness, which, by its power of resisting denudation, has given rise to the Mount M'Gann and Mount Robert Ranges. Both of these ranges occur in zones in which the hard rocks in question are closely grouped together, while the intervening softer

"country" has been channelled by the Hodgkinson River and Caledonia Creek into deep valleys.

The material with which the fissures are filled, forms veins or dykes, from 3 to 40 feet in width, of pure silica, in almost all of its various forms. It frequently resembles quartzite, and occasionally passes into ribbon jasper and calcedony. The veins are often so laminated parallel to their sides as to suggest that they may be beds rather than veins; but the mode in which they now and then cut across the adjacent strata, although preserving a general parallelism, sufficiently disproves this theory. Crystallisation is comparatively rare, and the lamination seems to imply by no means segregation of the silica from the surrounding strata, but rather deposition of silica during the passage of copious sheets of hot water charged with the mineral in solution. The veins (which they hardly are in the usual sense of the word), as laid down, in blue, on the map, are very striking; but in nature they are more remarkable still. They can be followed from hill top to hill top, forming at times rough insurmountable walls a hundred feet high—as, for example, in the peaks west of Mount Tenison Woods. In other places denudation has left their remains on hill sides or hill tops in the form of huge cubes of hard quartzite, from which the surrounding softer rocks have crumbled away. These cubes stand up weird and solitary, like the "perched blocks" of alpine and arctic lands.

The linear persistence of the veins in question is very remarkable. One, for instance, has been traced (with a few breaks) from Mount McGann to the head of Tyrconnel Creek, a distance of over 6 miles. The two veins intersecting Mount Robert have been followed for 4 miles each. In these, and many other cases, the tracing of the veins was abandoned for no other reason than that the limit of the map had been reached. Similar veins, it may be here observed, have been noted by me in the Cloncurry and Leichhardt region, where they attain still more gigantic proportions. The veins of the Cloncurry and Hodgkinson resemble the dolerite dykes of Scotland and Ireland more than the ore-charged reefs of Australia. The Hodgkinson veins, I have been informed, contain rare and minute quantities of gold. I have not been able to verify this information, and I suspect that the gold may have come from reefs adjacent to the veins. Specular iron ore, brown hæmatite, and binoxide of manganese, are not uncommonly found in cavities of the larger veins; but I have never seen either in payable quantities.

Regarding the age of the stratified rocks of the Hodgkinson Gold-field, it may be as well, before reviewing the evidence, to shake ourselves free of all pre-conceived ideas on the subject. On the authority of various geologists, the auriferous rocks of Northern Queensland have had attributed to them ages varying from Lower Silurian to Devonian. It is not, however, a question of authority, and the proofs of the age of New South Wales or Gympie rocks have no bearing on the age of rocks separated by 10 or 12 degrees of latitude, and whose connection with them has never been treated.

In a conglomerate on the hillside opposite the Glen Mowbray machine occur some large oval pebbles, or shingles of black shale. The shingles strongly resemble the graptolite shales of Victoria and the uplands of the south of Scotland. But they also are quite indistinguishable from the beds of dark shale which lie beside, and geologically both above and below the conglomerate bed in which they occur. I split open a great number of the shaly shingles in search of graptolites, but without success. They yielded, instead, a number of red-like plant impressions, invariably too indistinct for determination.

Near the northern boundary of the township of Thornborough is the Chance Tunnel. The locality is about a mile south of the conglomerate in Glen Mowbray, and the strata cut in the tunnel occupy a horizon which may be estimated at 4,620 feet below that of the conglomerate. They consist for the most part of dark-blue shales (commonly but improperly known as slates) with alternations of hard gritty greywackes and a few bands of fine conglomerate. The fine-grained greywackes yielded a "petrified snake," which was sent to the Brisbane Museum, and pronounced by Mr. C. W. De Vis to be a *Lepidodendron*, probably *L. australe* of McCoy. I visited the spot afterwards and saw some flattened stems and twigs, which may have belonged to *Lepidodendron*, but from which all the characteristic markings had disappeared. My visit left no doubt in my mind regarding the *bona fides* of the discovery. I found among the shales numerous casts of crustacean or molluscan tracks, some reed-like plant-impressions, and a fragment of carbonised wood.

Even if the shale pebbles, or boulders, or shingle (as the case may be) of the Glen Mowbray or other similar conglomerate should in future yield recognisable fossils, I should not necessarily regard the fossils as "derived" from some older formation which had been upheaved and subjected to denudation during the period marked by the deposition of the conglomerate. On the contrary, I should believe the fossils to be of practically contemporaneous origin. I believe the plant-remains of the Glen Mowbray shingles must have been derived from a shale bed which formed a part of the same formation. In my field experience nothing is more certain than that fragments of a shale bed will be found in any succeeding bed of conglomerate. The explanation is, I believe, to be found in the sun, drying and peeling off of flakes of the shale and their subsequent partial rounding by attrition. I say this by way of caution against hasty conclusions from future discoveries. In the very probable event, for instance, of the discovery in shale shingles of a determinable fossil—say *Lepidodendron australe*, the conclusion would be that the conglomerate containing the shingle was deposited in a geological age subsequent to the deposition of the shale containing *Lepidodendron australe*. This conclusion would be erroneous.

At the intersection of the road from Thornborough to Glen Mowbray with that which leads up to the Pioneer and Tichborne mines, is the outcrop of a bed of conglomerate in which pebbles up to 6 or 8

inches in diameter are packed in a matrix of greywacke. Of these some are greywacke, the majority quartz, and a fair proportion blue coralline limestone. Similar limestone pebbles are found in conglomerates in a number of places—*e.g.*, on the hill west of the City of Dublin reef, on the roadside in Glen Mowbray, near the junction of the Thornborough and Kingsborough roads, in the gully west of the shambles in Glen Mowbray, and in Tyrconnel Creek north of the Honest Lawyer.

As in the case of the shale pebbles of the Glen Mowbray conglomerate, I considered it very doubtful whether the fossils in the limestone pebbles were really "derived" from an older formation.* In this view I was subsequently confirmed by the discovery, about a mile and a-half south-west of Beaconsfield, of a conglomerate with similar pebbles containing similar fossils, almost immediately adjoining a limestone bed which had been quarried for mortar for the Antimony Smelting Works at Northcote. This bed is vertical, four feet at least in thickness, and strikes north-north-west, as do all the strata in the neighbourhood. The limestone was found to contain a number of shells and corals, but among these I could only recognise a *Retzia* and *Cyathophyllum helianthoides*, Goldf.

The corals, which weather out in relief from the limestone pebbles of the conglomerates, may therefore be ranked as contemporaneous with the strata of the goldfield. They include, I believe, many genera common to the Reid limestone, and the Burdekin limestone. *Retzia radialis*, Phillips, occur in the Star beds. Another species (*R. Salteri*) is met with in Yarralumla (Yass beds, N.S.W.) *Cyathophyllum helianthoides* has been recognized in the Yass beds.

The Star beds are characterised by the occurrence of *Lepidodendron australe*, McCoy, which has never been traced in Queensland, upward into the productive portion of the Coal measures. It will thus be seen that according to the palæontological evidence the homotaxis of the Hodgkinson rocks may be anywhere, from Upper Silurian to Lower Carboniferous. The Lower Carboniferous appears to have the strongest claim, according to the plant-remains, while the corals seem to favour more the Lower Devonian. The Hodgkinson strata, on the other hand, have suffered greater metamorphism and disturbance than the Star beds, and less than the Burdekin and Reid beds. They are, I suspect, part of the missing strata between the Star and the Reid beds.

The auriferous reefs are well defined, and are divisible into two groups or orders. Those of the first group coincide in their strike with the strike of the strata in which they occur. To this group belong the Tasmanian, North Star, Outward Bound, Amy Moore, Vulcan, Britannia, Caledonia, Forget-me-Not, Von Moltke, Lady Mary, Mark Twain, Rob Roy, Garry Owen, Tyrconnel, Black Prince, Henry Grattan, Commodore, Lizzie Redmond, Hero, Pioneer, Hope, and others. In all the members of this group a general law may be

* See Report of the Dept. of Mines for the year 1883, p. 55.

observed. They underlie at right angles to the dip of the strata. This circumstance can only mean that the fissures were produced by the same pressure that upturned the strata. Each stratum would break along a plane of least resistance, which would be found at right angles to the planes of bedding.

The second group which comprises the Bismarck, King Atilla, Lady Anne, Providence, Flying Pig, Tichborne, Idaho, Explorer, Great Northern, Devon and Cornwall, Empress of India, Alliance, Mowbray, Honest Lawyer, Fourth-of-July, Columbia, and Eureka, runs mainly north and south, and at right angles to the lines which denote the outcrops of the stratified rocks. Their underlie is always to the east. It is probable that they belong to a period subsequent to the first series of fissures.

The gold occurs in a matrix of laminated quartz, without much pyrites or galena (except in the case of some of the mines of the eastern Hodgkinson). There is, consequently, little difference in the productiveness of the stone above and below the water level. Blanks are met with here and there in most of the reefs—*i.e.*, spaces containing neither gold nor quartz, but only a brecciated gangue of sandstone and shale fragments. The gold almost always recurs in rather narrow "shoots," most of which die out (although the quartz may continue) at less than 400 feet in depth. There is, however, no reason to doubt that at greater depths other shoots will yet be discovered.

In addition to the reefs around the township of Thornborough and Kingsborough, Deep Creek, Woodville, the Eastern Hodgkinson, and Northcote are or have been important centres of mining industry. Antimony lodes occur at Woodville and Northcote. At the latter large smelting works have been erected.

The following returns of the yield of gold from the Hodgkinson are taken from the Annual Report of the Department of Mines for 1884. The returns from the Mulgrave Goldfield are included:—

					OUNCES.
To end of year	1877	...	...	...	59,516
"	1878	...	...	...	44,435
"	1879	...	...	...	33,675
"	1880	...	...	...	25,096
"	1881	...	...	...	15,308
"	1882	...	...	...	12,495
"	1883	...	...	...	7,505
"	1884	...	...	...	7,245

The returns include a quantity of alluvial gold, which gradually decreased from the first year. The field is at present in a depressed condition.

(5) The PALMER GOLDFIELD presents the same features as the Hodgkinson and is probably of the same age; but as it has not yet been geologically mapped, I cannot describe it. It has several beds of limestone, but these appear to have proved hitherto unfossiliferous. The Palmer has produced a larger quantity of alluvial gold than any

other field in the colony. The returns are given in the report of the Department of Mines for 1884 as follows:—

					OUNCES.
To end of year	1877	...	...	...	839,000
"	1878	...	...	...	120,233
"	1879	...	...	...	90,000
"	1880	...	...	...	65,433
"	1881	...	...	...	51,960
"	1882	...	...	...	37,339
"	1883	...	...	...	24,089
"	1884	...	...	...	15 637

CHAPTER III. DOTSWOOD BEDS.

The limestone of the Fanning River is the lowest bed of a basin of stratified deposits. These consist for the most part of grey, brown, and greenish flaggy sandstones and greenish shales. A few beds are white and well suited for building purposes. From one of the white beds I obtained a single specimen of a plant, which I submitted to Sir J. William Dawson. It proved to be a new species of the genus *Dicranophyllum* and was described as *D. australicum*.*

The upper portion of the Fanning limestone (a calcareous shale) contains impressions of the same plant.

The sandstones containing the above plant are the lowest beds of the "Dotswood" series described by me in 1879.†

In Keelbottom Valley, near Dotswood, the strata of this formation dip to the east at 30 degs., and form distinct ridges across the road and in the bed of the river. Taking into account its high dip and the extent of ground occupied by its outcrop, the series must be some thousands of feet in thickness. Beds of brown felspathic sandstone alternate with conglomerates and red (white-spotted) shales. The conglomerates contain pebbles up to 6 inches in diameter, the majority of which are of pink porphyry, a few being of hardened white sandstone or quartzite. The porphyry pebbles, as well as the felspathic sandstones and the gritty felspathic matrix of the conglomerates, clearly prove that the deposit was derived, as a whole, from the waste of volcanic or metamorphic materials. It bears a striking resemblance to the lower old red beds of Perthshire, Scotland.

* Note on New Erian (Devonian) Plants, Q.J.G.S. 37, p. 306.

† Report on the Geological and Mineral Resources of the District between Charters Towers and the Coast. Brisbane, 1879.

The beds on the left bank of the Burdekin, opposite Dalrymple, are of a character essentially similar to those of Dotswood. They consist of reddish and chocolate-coloured sandstones, which are often cross-bedded, and sometimes flaggy, with faint ripple marks. In places they enclose little pellets of chocolate-coloured shale. Buff ferruginous spots are common in the interior of the sandstone. The shales are occasionally greenish, but the red and chocolate-coloured beds predominate. The red and chocolate-coloured shales frequently weather spheroidally, and are dotted with white spots.

The little hill called Mount Keelbottom consists of a pale pinkish porphyry, with a base of acidic felspar, crystals of orthoclase felspar, and water-clear blebs of quartz. The porphyry has a quasi-schistose structure, especially noticeable on weathered surfaces. The same features may be observed in the hill immediately opposite Dalrymple, where a series of escarpments coincides in direction with the outcrop of the sandstone beds. It is more than likely that the porphyry is a metamorphosed volcanic tuff. Whether it is interbedded with the sandstone strata, or is of older date, is a question which I am not prepared to answer at present.

A visit to the Keelbottom River, in June, 1879, enabled me to include, in the Dotswood beds, the greater part of the Keelbottom Valley up to the junction of Speed Creek, and a considerable portion of the hilly region known as Table Top Downs. Leaving the eastward bend of the Keelbottom River, between the Plum Tree Inn and Speed Creek, to ascend the hill on the eastern side of the valley, several low-ridges are crossed, composed of grey-greenish and brownish sandstones, dipping at about 30 degrees to east-south-east. The sandstones are generally in not very thick beds, are hard and tough, and occasionally weather spheroidally. Some of the red beds are easily recognisable as having been derived from the waste of the granite. All the sandstones have a greater or less admixture of felspathic granules with the siliceous. Towards the base of the hill the sandstones become more conglomeratic than in the valley, the pebbles being of porphyry, quartzite, quartz, and various metamorphic rocks (gneiss, slate, &c.) The steep slope of the hill is of conglomerate. Near the top is a thick conspicuous stratum of yellow cross-bedded sandstone, capped by amygdaloidal dolerite, about 10 feet in thickness. The dolerite is again surmounted by yellow sandstone. The strata, when followed in ascending order at right angles to their outcrops, become gradually more and more mixed up with trappean beds (varying from dolerites to porphyrites) till, towards the Fanning, the intercalated sandstones are scarcely met with. These ancient lava beds, especially the porphyrites, are cupriferous over a wide area. Large masses of native copper are found in the Keelbottom Copper Mine.

CHAPTER IV.

GYMPIE BEDS.

The *County Rock*, of the Gympie Goldfield, is a series of strata on the eastern side of the Mary River, dipping at an average angle of 22 deg. a little to the north of east, with a regularity more frequently met with in coalfields than in Australian goldfields. The uppermost bed of the auriferous series is a limestone, at least ten feet in thickness, which can be traced from the railway line, near the cemetery, to the South Glanmire Block. The grey shales and sandstones, under which the limestone disappears to the east, appear to be entirely out of the goldfield. Below the limestone, however, to the west, the outcrop of a zone of rocks, intersected by a number of auriferous reefs, has given rise to a mining industry of great importance.

The rocks in question consist chiefly of grey shales, black pyritous shales, greywackes, sandstones, grits, and conglomerates. The sandstones are often slightly calcareous; the conglomerates are a mass of pebbles or boulders of all sizes up to a foot in diameter. These are generally well rounded, but in many cases the angular condition of the fragments in the grits and conglomerates suggests a volcanic origin. It is remarkable that the strata of the field present alternations of sedimentary rocks, which have undergone no alteration, with others which have become indurated and semi-crystalline.

The presence of "greenstone" has been a stumbling-block and a bugbear to the miners since first they were pointed out by Daintree and Aplin. The evil has increased in the course of years, owing to the tendency to conclude that green stone was "greenstone." A short visit to the field, in July last, satisfied me that whatever may have been meant by "greenstone" in the earlier days, the term is now applied indiscriminately by many of the miners, and some geologists, to varieties of volcanic ash (?), sandstones, and greywackes having a greenish tint, but presenting, in a greater or less degree, the granular texture characteristic of sedimentary rocks. One geologist, several years ago, published a map in which the whole of the strata of the field were ingeniously divided into "Fossiliferous Greenstone," and "Unfossiliferous Greenstone."

During my visit to the field, I saw a few instances in which "greenstone" (not in dykes) could hardly be attributed to the metamorphism of sedimentary rocks, and appeared, from its relation to the latter, to be really intrusive. It is a dark green crystalline rock, which probably was a dolerite or diorite, but even in microscopic sections it is much "masked" by viridite.

The richest deposits of gold occur in the reefs where the latter intersect "black slate" country. This is so well recognised that the fact has influenced the system of mining on the field. For prospecting purposes, a vertical shaft is generally sunk in the vicinity of a reef, till it strikes a band of black slate. A crosscut is then driven to

catch the reef. Four principal zones or horizons of black slate are recognised on the field.

The majority of the principal reefs, such as the Great Eastern, Glanmire, Columbia, Wiltshire, Smithfield, Wilmott, Phoenix, March, Golden Crown, Maori, Alma, Lady Mary, Caledonia, Hilton, California, Nil Desperandum, Louisa, Perseverance, Excelsior, and Alliance, have a general north, or north-north-west bearing, and underlie to the east, with an inclination which is nearly at right angles to the dip of the strata. The Helen Harkins has a north and south bearing, but underlies to the west at 65 deg.

The most important cross reefs are the Monkland, which bears north-west, and underlies south-west, and the Inglewood, which bears north-north-west, and underlies north-north-east.

The matrix of the gold is generally quartz, and not unfrequently calcite.

Two shafts are within a few feet of 1,000 feet in vertical depth; two more are to be sunk, with the aid of a Government subsidy, to 1,000 feet.

A second bed of limestone is seen on the right bank of the Mary, near the mouth of Tucker's Gully, and appears to be nearly at the base of the auriferous strata.

The field is disturbed by several important faults. One of these, in the line of Phoenix Street, I have calculated from the horizontal "throw" of the upper limestone, to have a downthrow of 528 feet to the north.

None of the reefs on the north side of this flat are recognised with certainty on the south side. A map of the reefs, constructed with great skill and care by Mr. Harry Rosser, has recently been published by the Government.

The yield of gold from Gympie, from its opening in 1867, is given in the "Annual Reports of the Department of Mines" as follows:—

					OUNCES.
To end of year 1877	...	...	...	...	625,000
" 1878	...	...	...	...	41,564
" 1879	...	...	...	...	38,453
" 1880	...	...	...	...	43,072
" 1881	...	...	...	...	67,861
" 1882	...	...	...	...	50,312
" 1883	...	...	...	...	64,812
" 1884	...	...	...	...	112,051
" 1885	...	...	...	...	86,832

Many of the articles published by the Gympie press contain valuable information regarding the peculiarities of the mines, and deserve a better fate than the ephemeral currency of a newspaper. The following official reports may be consulted on the geological and mining features of the Gympie goldfield:—

Report of the Government Geologist for South Queensland (C. D'Oyly H. Aplin), Brisbane: By Authority, 1868. Report on the Geology of the Districts of Wide Bay and Burnet; by A. C. Gregory, Brisbane: By Authority, 1875.

Daintree's paper on the Geology of Queensland contains notes on Gympie. Professor Liversidge has made an analysis of the Gympie "greenstone," which is given in the Transactions of the Royal Society of New South Wales, 8th December, 1880.

Mr. Daintree's collection from the Gympie goldfield formed the subject of a valuable paper by Mr. Robert Etheridge, senior.* He describes the following fossils:—

POLYZOA.

Fenestella fossula, Lonsdale.
Ceriopora laxa, Eth.

BRACHIOPODA.

Productus cora, D'Orb.
Spirifera bisulcata, Sow. var. *acuta*.
,, *vespestilio*, Sow.
,, *dubia*, Eth.
,, *undifera*, var. *undulata*, Römer.
Strophomena rhomboidalis, var. *analoga*, Phillips.

LAMELLIBRANCHIATA.

Aviculopecten limaeformis, Morris, sp.
,, *imbricatus*, Eth.
,, *multiradiatus*, Eth.
Edmondia concentrica, Eth.
,, *obovata*, Eth.

GASTEROPODA.

Plurotomaria carinata, Sow.
Euomphalus, sp.

In McCoy's *Prodromus of the Palæontology of Victoria* (Decade I. p. 38) the author refers to his *Lepidodendron australe* (the same plant which was described by Carruthers as *L. nothum* Unger) as having been found at Gympie. There appears, however, to be a mistake here, as Mr. Carruthers describes the plant without mentioning any locality more definite than "Queensland,"† while Mr. Daintree refers to the specimens sent to Mr. Carruthers as coming from "Mount Wyatt, Canoona, and the Broken River." We may, therefore, leave *Lepidodendron australe* out of the question as affecting the age of the Gympie beds.

Mr. Daintree, on lithological, and Mr. Etheridge, on palæontological grounds, agree in regarding the Gympie beds as Devonian. Mr. Etheridge's list, however, when closely analysed, appears to point to a different conclusion.

Of the 14 fossils specifically determined by Mr. Etheridge,‡ six are

* Q.J.G.S.L. xxviii., p. 317.

† Q. J. G. S. xxviii., p. 350.

‡ *Ceriopora* (?) *laxa*, Eth., *Spirifera dubia*, *Aviculopecten imbricatus*, Eth., *A multiradiatus*, Eth., *Edmondia concentrica*, Eth., and *E. obovata*, Eth.

of species either new or doubtful;* four are European carboniferous.

One† of the new species is most nearly allied to an Irish carboniferous species. One‡ ranges in Europe from Silurian to carboniferous, while only one§ is exclusively Devonian. The balance of evidence appears to be much in favour of a homotaxial relation with the European carboniferous.

In their paper on "Palæozoic Corals from Northern Queensland" || Messrs. Nicholson and Etheridge, Junior, describe a new species of the genus *Stenopora* from Gympie.

The late Rev. W. B. Clarke¶ gives the following list of fossils "capable of identification" from Gympie.

Nucula.

Fenestella.

Solarium.

Spirifera.

Orthonota.

Edmondia.

Stenopora.

Producta.

In an appendix (xvi. c) to Mr Clarke's "Sedimentary formations" Prof. de Koninck adds *Spirifer Strzleckii*, de K., to the Gympie list.

I have recently sent to Mr. Robert Etheridge, Junior, a large collection from Gympie. The fossils have not yet been named, but Mr. Etheridge writes me that he inclines to regard them as mainly carboniferous.

In his "Fossil Flora of the Coal Deposits of Australia" (p. 99), the Rev. J. E. Tenison-Woods adds to the list a plant like *Cordaite australis*, M'Coy; and (p. 119) *Cordaite australis*, M'Coy (?). The latter is also found in the Drummond Range, at Bogantungan.

The following fossils from Gympie are in the Queensland Museum, Brisbane:—

Pecten, sp.

Heliolites porosa, or *Heliopora*, or *Astræa porosa*, Goldf.

Alveolites vermicularis, M'Coy.

Pleurotomaria rotunda, Eth.

Streptorynchus Davidsoni, Eth.

Spirifera, all. to *S. bisulcata*, Sow.

S. „ *S. striata*, Sow.

S. *convoluta*, Phillips.

Streptorhynchus (*Orthotetes*) *crenistria*, Phill.¹

¹ Common in the Bowen River Coalfield.

* *Productus cora*, D'Orb., *Spirifera biscalata*, Sow., *Aviculopecten limaeformis*, Morris, and *Pleurotomaria carinata*, Sow.

† *Ceripora laxa*

‡ *Strophomena rhomboidalis*, var. anal. Phillips.

§ *Spirifera undifera*, var. *undulata*. Römer.

|| Ann. and Mag. Nat. Hist. for October, 1879, p. 276.

¶ Sedimentary formations of New South Wales, Fourth Edition, 1878, p. 20.

Atrypa (Spiriferina) reticularis, Romer.

Productus longispinus, Sow.

Athyris concentrica, Vox' Buch.

Stringocephalus Burtini, De France.

Astræa porosa.

In Mr. Rands' "Report on the Goldfields of Raglan, &c." (Brisbane: By Authority. 1885), reference is made to a series of limestones and sandstones close to Yanot Station, containing the following fossils. So many are common to the Gympie beds that it seems advisable to class the deposit as of the same age:—

POLYZOA.

Fenestella.

Retepora.

Ceriopora.

BRACHIOPODA.

Spirifera undifera.

S. Undata?

Strophomena rhomboidalis.

S. sp.

Productus.

Rhynchonella.

LAMELLIBRANCHIATA.

Aviculopecten.

GASTEROPODA.

Pleurotomaria.

CEPHALOPODA.

Casts of *Orthoceras*, with central siphuncle.

Some slates containing fenestella, &c., from the Training Wall Quarries, Rockhampton, forwarded by Mr. James Smith, so much resemble some of the Gympie beds that, in the meantime, I map a small area as of the same age.

CHAPTER V.

STAR BEDS.

THE Star Basin forms a small area (about 36 square miles) at the junction of the Big and Little Star Rivers, tributaries of the Upper Burdekin. Disposed with only a gentle dip, and consisting of unaltered stratified rocks, it forms a striking contrast to the surrounding granites, gneisses, slates, and schists. The latter, occurring

between the Star and Keelbottom Rivers, and forming the "country rock" of the Star Goldfield, and the now much better-known silver-field of Argentine, as well as the stanniferous porphyry of Running Creek, are of much older date than the rocks named by me, in 1878, the "Star Beds."

The base of the Star beds is a coarse, hard siliceous sandstone or grit, with quartz pebbles. This grit is well seen in a hill to the south of the road, $3\frac{1}{2}$ miles south-south-east of the Star Station, overlying the granite of the comparatively low country, and dipping to the west at an angle of 120 degrees, the grit presents an escarpment to the east, which rises to the height of about 200 feet. A good section of the same beds is seen in Horse Creek—their total thickness cannot be less than 300 feet.

I estimate the total thickness of the Star Beds at 1,200 feet. From a careful survey made in 1878, I am enabled to furnish the following table of strata:—

	Feet.
Green shales, and fine hard calcareous sandstones (Little Star River, at ford on Coppermine road)	20
Coarse conglomerate (Little Star River, at mouth of Horse Creek) ...	15
Gap	20
Shales and dark-blue sandstones (Horse Creek, south of station paddock)	20
Horse Creek, near crossing of Star road { Calcareous sandstone and shales*	20
Gap { Thin limestones*	5
Coarse conglomerate (Little Star River, north of ford, on Copper Mine road)	30
Gap	25
Donald's Creek. { Blue shales, with ironstone noddules,* and thin limestone bands ...	35
Thin, hard calcareous sandstone and shales*	85
Thin, hard sandstone and shales	65
Gap	40
Sandstone and shales, confused	25
Good blue limestone	100
Shales and hard sandstone*	3
Hard sandstone, in part weathering spheroidally	20
Probable gap	25
Brock's Creek. { Hard, yellow sandstone, calcareous band, and hard shale	15
Gap	10
Limestone	12
Probable gap	35
Green shales* (Corner Creek)	10
Sandstone (Mouth of Sandy Creek)	10
Gap	35
Bluish Calcareous shales* (West fork of Sandy Creek, near Grave) ...	15
Gap	190
Grits and conglomerates (Horse Creek, and hill to south, Dinner Creek, and Little Star River Granite)	300
Total	1,200

The beds in the above table marked with an asterisk have proved fossiliferous.

Mr. Robert Etheridge, jun., furnished a report, in 1878, on my collection of fossils, which has, however, never been published, as I

have long cherished the idea of procuring a more extensive collection. Mr. Carruthers, of the British Museum, examined and named the plants. The following is their list:—

Lepidodendron nothum (Unger) ? Carruthers.

(*L. Australe*, McCoy.)

Plant, allied to *Cyclostigma*.

Calamites ?

ECHINODERMATA.

Crinoid stems, Indet.

POLYZOA.

Fenestella.

ACTINOZOA.

Corals, Indet.

BRACHIOPODA.

Spirifera Urei, Fleming¹

¹ Not distinguishable from the British carboniferous species (*S. Urei*, Fleming), more especially the Devonian variety, *unguicula*, Phillips.

Spirifera, allied to *S. bisulcata*, Sowerby²

² A carboniferous species.

Spiriferina, sp.

Athyris, sp. like *A. planosulcata*, Phillips.

Retzia, sp., allied to *R. radialis*,³ Phillips.

³ A carboniferous species.

Strophomena rhomboidalis, Wilck (?)

Orthis, species 1, large common form, resembling *O. resupinata*,⁴ Martin.

⁴ Carboniferous.

Orthis, species 2, small form, resembling *Streptorhynchus*.

Chonetes, sp. 1, like *C. Hardriensis*, Phillips.

Chonetes, sp. 2, resembling *C. Hardriensis*, Phillips (Davidson), and *C. polita*, McCoy.

Rhynchonella (?) sp.

LAMELLIBRANCHIATA.

Aviculopecten, sp. 1.

„ sp. 2.

„ sp. 3.

„ sp. 4, section *Eüchondria*.

Entolium, sp. near *E. Sowerbii*,⁵ McCoy.

⁵ Carboniferous.

Leda (*Nuculana*) sp. near *Nuculana bellistriata*, Stevens, *Cardiomospha* or *Posidonomya*.

GASTEROPODA.

Natica (= *Naticopsis*, McCoy) sp. allied to *N. variata*, Phillips.

Natica or *Macrocheilus*, sp.

Etiomphalus (?)
Bellerophon sp.
Porcellia puzio, Leveille.
Loxonema or *Murchisonia*.

CEPHALOPODA.

Orthoceras, sp. 1.
 „ sp. 2.

CRUSTACEA (TRILOBITA).

Phillipsia (?)

In addition to the above, which have been determined by Messrs. Etheridge, junior, and Carruthers, Mr. Philip W. Pears, lately Warden of the Ravenswood Goldfield, has presented to the Survey Collection a number of specimens from Corner Creek, the locality which yielded to me the greater part of the fossils included in the above list. Mr. Pears' collection includes two well-marked specimens of *Lepidodendron australe*, McCoy, *Knorria*, like *K. imbricata*, Sternberg.* *Retzia*, *Spirifera* (identical with that described by Mr. Etheridge as allied to *S. bisulcata*, Sow.) an impression of part of an encrinite, a coral or fenestella, and a perfect specimen of *Phillipsia*, Portlock, the latter bearing out the conjecture of Mr. Etheridge.

In "Mines and Mineral Statistics of New South Wales," 1875, p. 132, Mr. Wilkinson observes that "below the Lower Marine beds of the Hunter district are beds of shales and sandstones, with several species of *Cyclopteris*, *Knorria*, *Sigillaria*, *Stigmara*, *Lepidodendron*, &c. They occur near to, and probably in association with, beds of marine fossils, which have been described as Lower Carboniferous."

There is every probability of the identity of these New South Wales fossiliferous beds with the Star beds. As the former lie beneath the Hunter River beds (= our Bowen River series), there is a little difficulty in assigning to the Star beds a lower horizon than that of the Bowen River coalfield—a position warranted by the palæontological evidence.

MT. WYATT.

"Slightly inclined grits and sandstones of the Upper Devonian *Lepidodendron* beds, rest on the upturned edges of a series of blue and grey slates and shales, which have yielded fossils determined by Prof. McCoy, and were referred by him to the Upper Silurian."†

CANOONA.

As Daintree mentions that *Lepidodendron nothum*—(*L. australe*, McCoy) was found at Canoona, a small area is coloured on the map as the equivalent of the "Star Beds."

BROKEN RIVER.

Daintree refers‡ to the Broken River as one of the localities from

* Lower coal measures, Arkansas.

† Daintree. "General Report upon the Northern District. Brisbane: By Authority, 1870, p. 7.

‡ Q. J. G. S., London, vol. 28, p. 289.

which Mr. Carruthers detected *Lepidodendron nothum*, Unger—(*L. Australe*, McCoy). It may be surmised that the *Lepidodendron* beds occur in a horizon equivalent to that of the Star beds, and separable from the beds which have yielded the corals described by Mr. R. Etheridge, Senior. (Burdekin Beds.)

DRUMMOND RANGE.

The Central Railway affords admirable sections of the strata of the Drummond Range. Three miles and a half east of Pine Hills station ($248\frac{1}{2}$ mile peg), yellow gritty sandstones and shales are seen dipping at 7 degs. to the west, a dip which would carry them beneath the desert sandstone.

At 243 miles similar sandstones dip to the south at 12 degs.

From Hannam's Gap (235 miles) to Bogantungan (227 miles) the strata consists of finely laminated fine-grained blue-grey sandstone, and blue, grey, and greenish, and occasionally purple shales. Thick beds of hard gritty white, yellow, or brown siliceous sandstone occur at intervals. From Hannam's Gap to Bogantungan the strata dip at an average angle of about 2 degs. to the east (a little steeper than the grade of the railway). At Bogantungan is the centre of a synclinal trough, and as far eastward as Withersfield the dip is towards the west. The total thickness of the series is probably not less than 2000 feet.

Lithologically, the rocks of the Drummond Range do not, as a whole, bear a very strong resemblance to the Star beds; but their fossils appear to place them on the same horizon. It is, however, possible that the Dotswood beds may be partly represented in the Drummond Range. The following list is taken from the Rev. J. E. Tenison-Wood's "Fossil Flora of the Coal Deposits of Australia," and his report to the Minister for Lands on "Coal on the Central Railway," (Queensland, 7th August, 1883):—

Lepidodendron australe, McCoy (Bogantungan).

Knorriastadium (?) (Drummond Range).

Cordaite australis, McCoy (?) (Bogantungan).

Cyclostigma australis.

Stigmaria (*Cyclostigma*) (?) (Drummond Range).

Calamites radians.

C. varians.

Fern resembling *Neuropteris gigantea*, Sternb. (Bogantungan).

CHAPTER VI.

BOWEN RIVER AND OTHER COALFIELDS.

THE series of rocks culminating in the Bowen River Coalfield commences with a thick bed of coarse volcanic agglomerate, seen near the head of Pelican Creek. It forms a hill, which presents a steep escarpment to the north, and a gentler slope to the south. The escarpment is traceable for some distance to the west and north-west.

The agglomerate is made up of angular, or but little rounded, pebbles and boulders of porphyrite and dolerite, and rests on an uneven surface of granite.

What I have named the *Lower Series* (I) of the coalfield is composed mainly of white and yellow sandstones, with some beds of conglomerate. The latter contains pebbles of quartzite and yellow porphyry, derived from the adjacent metamorphic country. A few are of porphyrite. The thickness of the series is estimated at 880 feet.

The lower series passes beneath the bedded trappean rocks of Mount Toussaint, Mount Divlin, and Mount Macedon, which are described under the heading "Basalt, Diorite, &c.

The *Middle or Marine Series* (II.) of the coalfield overlies the trappean beds, without any mark of a serious break in the continuity of deposition. The trappean and sedimentary beds have been disturbed from their originally horizontal position, at the same period and in the same degree. The activity of the volcanic forces must have considerably diminished before the deposition of the marine series began, for neither lavaform nor ashy beds occur again in the history of the coalfield. But that the volcanic activity of the district in question did not entirely cease for a long time is proved by the fact that molten rocks of the dolerite type were again and again injected along lines of weakness in the sedimentary rocks.

I estimate the total thickness of the marine series at 1,848 feet. The series consist of alternations of grey and yellow sandstones, and blue and grey shales, with here and there bands of reddish ferruginous (probably once calcareous) sandstones, sometimes varying to sandy, impure ironstones. The ferruginous sandstones are store-houses of marine fossils, which occur also, though more sparingly, in the shales and grey sandstones. In the latter, the shells are almost always calcareous, and contrast strongly with the siliceous and felspathic sandstone matrix. In the ferruginous sandstones, on the other hand, the fossils are always casts. The shales and grey sandstones are frequently pierced by rootlets, in the position in which they grew. A few beds of conglomerate are met with, chiefly in the lower portion of the series. The included pebbles are generally of granite, slate, schist, quartzite, &c., with a few of porphyrite. The pebbles, which are not always well rounded, have a remarkable tendency to arrange themselves in groups or heaps, as if they had

been dropped from the floating roots of trees, or, more probably, from floating ground-ice. Large isolated boulders of granite, &c., occur here and there in the midst of strata of fine sandy or muddy material. Portions of the silicified trunks of coniferous trees are occasionally found lying horizontally in the strata.

Three seams of coal (besides some carbonaceous beds, hardly deserving the name,) are seen in Pelican Creek. One, the *Garrick*, is 4 ft. 7 in. in thickness. It is partly burnt by an intrusive sheet of "white trap." Where it is least affected by the igneous rock, it is a fair bituminous coal, but contains a good deal of sulphur.

About 20 ft. below the *Garrick* seam, a second seam is seen in the bed of the creek. It is 1 ft. 9 in. thick, with two bands of clay, each 1 inch thick. This seam is clean and fresh, and has been used for steam purposes in the pumping engine attached to the diamond drill, for which purpose it has proved well adapted.

A bore (No. 1) was put down with the diamond drill last year, at the expense of the Government, under the direction of Mr. S. Hester, on the left bank of Pelican Creek. I examined the cores, and made a section, of which the following is an abstract:—

	FEET. INCHES.	
Loam and Clay	4	0
Loose Rock	4	0
Fine-grained buff micaceous Sandstone	61	0
Mud seam, hardening downwards into black micaceous Shale	1	0
Fine-grained dark grey micaceous Sandstone, with Plant impressions	0	6
Dark sandy Shale	0	6
Soft Clay	0	1
Soft COAL (no core)	1	0
Burnt COAL	1	6
Mixed white Clay and Pyrites... ..	0	0½
Burnt COAL	2	4½
Fire Clay	0	1
Sandstones with streaks of carbonaceous Shale	33	11
Conglomerate	0	3
Gritty Freestone, with carbonaceous streaks and Plant impressions	70	9
Fine-grained grey Shaley Sandstone	4	0
Burnt COAL	2	0
Clay	0	1
COAL (inflammable)	1	0
Clay	0	1
Burnt COAL	2	9
White Trap	0	8
Dolerite	0	8
Sandstone and Conglomerate	0	6
COAL	3	4
Fine-grained blueish-grey and shaley Sandstone, with a coaly streak	19	11
COAL, good (no core)	0	6
Gritty Sandstone with dark streaks	69	6
COAL, good (no core)	0	3
Carried forward	286	3

	FEET.	INCHES.
Brought forward...	286	3
Dark blue Shale and burnt COAL, occasionally shaley, and full of Pyrites	2	3
White Trap, passing downwards into Dolerite	0	6
Dolerite	5	0
White Trap, involving Coal	4	0
Blue-black Shale with Coal streaks and <i>Glossopteris</i>	5	0
Black Shale with Plant remains	1	6
Dolerite, involving Coal	2	0
Burnt COAL	0	6
White Trap and burnt COAL	0	9
Calcite Geode with Pyrites Crystals	0	0½
Burnt COAL	0	0½
White Trap	0	0½
Burnt COAL	1	2
Black Shale with <i>Glossopteris</i>	0	6
COAL, good	5	5½
Breccia of fragments of hard white Clay and black Shale with coaly streaks	6	7
COAL, good	0	2
Black Shale	3	3
COAL, good	0	6
Black Shale with Plant remains	3	6
COAL, good	0	1
Black Shale with Plant remains	0	11
COAL, good	0	6
Black Shale with Plant remains and Breccia	7	8
Dolerite, passing into white Trap at top and bottom	1	10
Black Shale with Plant remains	2	2
Breccia	1	1
Coaly layer	0	5
Black Shale with Plant remains	0	8
No record	6	8
Amygdaloidal Porphyrite of the bedded Trappean series, between series I. and II.	39	6
	390	6

The most interesting feature of this bore is the presence, at the base, of the marine series, of a considerable thickness of strata, containing *Glossopteris*, and undoubtedly on a lower horizon than the sandstone overlying the Garrick seam, which contains marine fossils.

Near the "*Garrick*" seam, but apparently divided from it by a fault, is the "*Kennedy*" seam, 1 foot 6 inches in thickness. Its position in the series is probably higher than that of the Garrick seam, but, owing to the supposed fault, this is uncertain.

The *Lower*, or *Marine series*, corresponds lithologically and palaeontologically with the "Upper Marine beds, Lower Coal measures, and Lower Marine beds" of the New South Wales Coal measures.*

The *Upper* (mainly Freshwater) *Series* (III.) of the Bowen coalfield, is exposed in Jack's Creek, the Bowen River, from the mouth of

* See "Mines and Mineral Statistics of New South Wales, 1865," and the Rev. W. B. Clarke "On the Sedimentary Formations of New South Wales," 4th Ed., 1878, p. 66.

Cockatoo Creek to Beesley's old camp, Cockatoo Creek, Rosella Creek, Plum Creek, &c.

In Jack's Creek a considerable thickness is seen of greenish-grey sandstones which contain trunks of large coniferous trees, lying horizontally, as if drifted. The trunks occasionally retain some of the branching roots. They are silicified to a black flint, sometimes partly opalised. One tree was found to measure 31 feet in length. Fragmentary plant remains in a carbonised condition are also common. Near the mouth of the Creek a thickness of 20 feet of fine, grey, argillaceous sandstone bands, with plant remains and grey shales, is seen cut into and overlaid by an intrusive sheet of dolerite. In one place at the base of the dolerite a 5 feet seam of burnt coal ("Macarthur Seam") was seen. In Macarthur Creek, on the opposite side of the Bowen River, the following section of the Macarthur seam and associated strata is to be seen:—

	FEET. INCHES.	
Dolerite	12	0
Burnt COAL	0	2
Grey Shale	5	0
Burnt COAL with shaly layers	1	7
Hard, grey, ferruginous Sandstone	0	4
Burnt shaly COAL	1	7
Grey-brown Sandstone with plants 3 in. to	0	7
Grey Shales	0	3
Darker Shales, with coaly laminæ	0	9
Bituminous COAL	0	1
Grey Sandstone	0	1
COAL with Shale laminæ, the coal laminæ of fair quality 1 ft. 2 in. to	1	9
Fire-clay with root-lets	0	4
Dark Shale	0	8
Grey-brown ferruginous shale—a mass of <i>Glossopteris</i>	0	4
Brown Shale	0	5
Grey-brown ferruginous Shale—a mass of <i>Glossopteris</i>	0	3
Grey Shale with <i>Glossopteris</i> , &c.	4	0
Grey Sandstone, thin bedded, with plants	30	0
	60	2

The DAINTREE seam lies near the base of the series, and is seen in the river just below the mouth of Rosella Creek in the following section:—

	FEET. INCHES.	
Dolerite, the lower part "white trap"	25	0
Gap, room for	10	0
Burnt COAL—partly columnar, somewhat coked in part; veins and pockets of "white trap" in upper part; concretions of ironstone in joints; nodules of decom- posed pyrites; <i>Glossopteris</i> recognisable in parts	3	7
Black Shale	0	1
Burnt COAL	0	3
Black Shale	0	1
Burnt COAL	0	6
Carried forward	39	6

Brought forward	39	6
Black Shale	0	1
Burnt COAL	0	10
Blue-grey Shales	1	2
Stony burnt COAL, with silky plant debris	0	6
Light, porous, crumbling COAL, with concretionary nodules of better quality	0	8
Coaly Shale	0	2
Light brownish-black laminated COAL (some of the laminæ rather oil shale than coal); fair quality	7	0
Blue-black Shales	2	3
Good COAL	0	3
Dark blue Shales with Phyllothea, &c.	10	0
Flaggy brown Sandstone with plants	0	10
Ironstone	0	1
Blue-grey Shales... ..	1	6
Brown Sandstones with ferruginous concretions	0	3
Brown flaggy Sandstone with plants	1	6
Grey Shales with a 1½ inch band of clay-ironstone	4	0
	70	7

The "HAVILAH" Coal seam, near the station of that name, is among the uppermost beds now remaining of the Freshwater series. It is at least 15 feet thick, but is burnt and rendered partly columnar, by a sheet of igneous rock, which takes the form of dolerite where it overlies, and of "white trap" where it comes in contact with the coal. A great thickness of greenish-grey sandstones with fossil trees underlies the Havilah seam.

It will be seen from the analyses which follow that a portion of the Daintree seam, 7 feet in thickness, is of fair quality, while the 3-inch band below is of good quality. The latter would be suitable for steam-making and metallurgical purposes.

The outcrops of several other coal seams occur in the fresh water series. They happen to be accompanied by the hard rock which destroyed them, and to this circumstance they owe their exposure to observation. The outcrops of only a small proportion of the strata are seen in natural sections. The chances are ten to one that seams of good coal will have their outcrops denuded, and covered up with alluvial deposits. Such seams can only be discovered by boring. The Government have lately set the diamond drill to work on a bore through the outcrop of the Havilah seam. The total thickness of the Freshwater Series is estimated at not less than 1,000 feet.

On the road from Havilah to Byerwin, a mile above the crossing of Rosella Creek, a marine bed is intercalated among the strata of the Freshwater series. As will be seen from the lists which follow, this marine bed contains a number of fossils common to the Lower Marine Series. This fact is very interesting taken in connection with the circumstance that *Glossopteris* lived on from the base of the marine to the top of the freshwater beds.

ANALYSES OF COALS.

SEAM.	Sp. gr.	Water	Volatile Hydrocarbons	Total Volatile	Fixed Carbon.	Ash.
Kennedy	1.46	1.12	41.81	...	49.79	14.28
Garrick	1.45	1.23	35.25	...	46.60	16.92
Do., nodular part	1.40	0.99	19.89	...	67.58	11.54
5 ft. 5½ in. seam, at 309 ft. 6½ in. bore below Garrick Seam	1.15	...	...	20.25	61.57	17.03
1 ft. 9 in. seam in bed of Pelican Cr'k, below Garrick Seam	1.37	2.26	23.61	...	59.09	15.04

FOSSILS OF TYPICAL DISTRICT

I. LOWER DIVISION.

Has yielded no fossils as yet.

II. MIDDLE OR MARINE SERIES.

PLANTÆ.

Glossopteris, near *G. ampla*, Dana.

CLASS ACTINOZOA.

*Stenopora*¹ *ovata*, Lonsdale.

Stenopora Jackii, Nich. and Eth., junr.

¹ Genus confined to Carboniferous or Permian-Carboniferous formation of Australia and Tasmania.

CLASS POLYZOA.

Fenestella fossula, Lonsd.

Protoretepora Koninckii, sp. nov., Nich. and Eth.

Protoretepora, sp. indet.

CLASS BRACHIOPODA.

Spirifera glabra, Martin.

„ *convoluta*, Phillips.

„ *Darwinii*, Morris (?)

Orthotetes crenistria, var. *senilis*, Phillips.

Productus subquadratus, Morris (?)

„ *brachythærus*, G. Sow.

Strophalosia Clarkei, Etheridge.

„ *Gerardi*, King (?)

CLASS PELECYPODA (LAMELLIBRANCHIATA.)

Aviculopecten subquincunclineatus, M'Coy.

„ sp. ind.

Peterinea macroptera, Morris.

Notomya (Mæonia) recta, Dana.

Pachydomus (?) *carinatus*, Morris.

Pachydomus lobosus, J. de C. Sow.

Sanguinolites, sp. ind.

„ sp. allied to *S. undata*, Dana.

„ or *S. Mitchellii*, De Koninck.

CLASS CEPHALOPODA.

Goniatites micromphalus, Morris.

III. UPPER (MAINLY FRESHWATER) SERIES.

PLANTÆ.

Glossopteris Browniana (Brongniart)

„ (*linearis* M'Coy.)

Phyllothea australis, Brong.

Araucaryoxylon Nicholi, Carruthers, sp. nov.

A marine bed in the Upper (mainly freshwater) Series has yielded the following :*—

CLASS BRACHIOPODA.

Orthotes crenistria, var. *senilis*, Phillips.

Productus brachythærus, G. Sow.

CLASS PELECYPODA

Pachydomus, or *astartilia*, near *A. cyprina*, or *A. cytherea*, Dana.

CLASS GASTEROPODA.

Indeterminable fragments.

CLASS CEPHALOPODA.

Goniatites, sp., ind., near *G. striatus* Dana.

In No. 1 Bore on Pelican Creek (Middle or Marine bed) *Glossopteris* was seen in the core. From the occurrence of *Glossopteris* in the middle and upper divisions and the repetition in the marine bed of the upper (mainly freshwater) division of many of the fossils of the middle division, there appears to be no doubt of the continuity of the series. The divisions correspond most accurately with the classification of the New South Wales Coalfields, as worked out by Mr. Wilkinson.†

The Queensland Upper Series corresponds with the Upper Coal measures of New South Wales (Newcastle, Wollangong, and Bowenfels beds), characterised by the occurrence of silicified coniferous wood, *Glossopteris* and *Phyllothea*, while the Middle or Marine series of Queensland agrees with the Upper Marine beds, Lower Coal measures, and Lower Marine beds of New South Wales.

Although the divisions made out in the Bowen River coalfield are of the highest importance in their bearing on a co-relation with the New South Wales field, the fossils of both the fossiliferous divisions

* The Rev. J. E. Tenison-Woods ("Fossil Flora, p. 53,") says: "I think I recognised *Sphenopteris lobifolia*, Morris, among my specimens from the above bed—probably at the Melbourne Exhibition of 1880."

† Mines and Mineral Statistics of New South Wales, 1875, p. 129.

(II and III) may, for the reasons above given, be massed together in considering the age of the deposits. We may add to the above list the list given by Mr. R. Etheridge, Senior, from the Bowen River * (Daintree Collection).

Streptorhynchus Davidsoni, Eth., sp. nov.

Productus Clarkei, Eth., sp. nov.¹

¹Afterwards named *Strophalosia Clarkei* by R. Etheridge, Junior, from complete specimens in my collection.

Spirifera striata, Martin.

„ *convoluta* (?) Phillips.

„ allied to *S. bisulata*, Sow.

The conclusion drawn by Mr. R. Etheridge, Junior, after a careful examination of my Bowen River fossils is that they occupy “a high position in the palæozoic series, and that all purposes would best be served by regarding them as of Permio-Carboniferous age.”†

In this finding I cannot but concur. The occurrence of *Glossopteris Browniana* in the Bowen River beds may appear to present a difficulty, as the Rev. J. E. Tenison-Woods‡ points out that this species “is found in beds as high as the Jurassic in India, and is a common fossil in lower Mesozoic formations there.” The same author observes § speaking of the Upper Newcastle beds (Division III, Bowen River beds): “In the present day the Australian flora is several epochs behind Europe, *then* it must have been a little in advance.”

OAKEY CREEK COALFIELD, COOKTOWN.

The deposit contains silicified wood very like that found in the Bowen River Coalfield, and *Glossopteris Browniana* in abundance. From the wide range of the latter plant it would be unsafe to determine the age of the field on its evidence alone. In the meantime, however, we may provisionally consider the deposit as the equivalent of the Upper or Freshwater Series of the Bowen River Coalfield to which it bears a marked lithological resemblance.

The strata consists, for the most part, of greenish-grey sandstones, dark blue shales and fire-clays. They have suffered a good deal of disturbance, being frequently on edge, or inclined at high angles. The thickest seam of good coal which has yet been met with (on Coal Creek) is 14 inches.||

The Rev. J. E. Tenison-Wood mentions¶ the occurrence in the Oakey Creek beds of *Phyllothea* (indica, ?). In a subsequent work,

* Q. J. G. S. 28, p.p. 333 et seq.

† On a collection of fossils from the Bowen River Coalfield, &c., Royal Physical Society of Edinburgh, 18th Feb., 1880, p. 57.

‡ “Fossil Flora,” p. 20.

§ Op. Cit., p. 21.

|| See “Report on Explorations in Cape York Peninsula, 1879-80.” By Robert L. Jack. Brisbane: By Authority, 1881.

¶ Proc. Linnean Soc. New South Wales, Vol. VII., p. 95.

however,* he says —“I now wish to state that, after a careful examination, there is no evidence that the specimens belong exclusively to *Phyllothea*.

ENDEAVOUR RIVER COALFIELD, COOKTOWN.

Coal is said to have been discovered in the valley of the Endeavour. This may be a continuation of the Oakey Creek field, but I have not yet seen the place, nor obtained any definite information regarding it.

LITTLE RIVER COALFIELD, NEAR PALMERVILLE.

As regards Palaeontological evidence, the Little River coalfield is in the same position as the Oakey Creek field. *Glossopteris* is abundant, but, beyond this, only some impressions of tree-trunks have been observed.

The Coalfield occurs in a peculiar position. It has been wedged, by two faults, into the midst of an older series of greywackes, slates, quartzites, &c. After having been subjected to such a degree of lateral compression, that its strata were inclined at high angles, it was covered over by a cake of “Desert Sandstone.” This cake has been subsequently cut through by the Little River (a tributary of the Kennedy), exposing the coal measures and the older stratified rocks.

The coal-bearing strata consist mainly of blue and dark shales, gritty sandstones, and fire-clays.

The coal seams are numerous and thick. One is 20 feet in thickness, another 18 feet, two are 8 feet each, two are 6 feet each, and four are 3 feet each; but all of these thick seams are of poor quality. They appear to have been from the first much mixed with muddy sediment, and to have had their volatile matter driven off by the pressure which resulted in the uptilting of the beds.

An eight-feet seam, on the bank of the Little River, near Bowerbird Gully, was analysed by Mr. Karl Staiger as follows :—

Moisture, with a little Gas	...	...	...	...	...	18·32
Carbon	...	...	...	...	...	65·94
Ash	...	...	...	...	...	15·74
						<u>100·00</u>

I analysed specimens from a seam eight feet thick, on Dave Creek, with the following result :—

Water...	...	...	...	...	...	0·919
Volatile Hydrocarbons	...	...	...	...	...	9·388
Fixed Carbon	...	...	...	...	...	58·606
Ash	...	...	...	...	...	31·087
Sp. gr. 1·37.						<u>100·000</u>

* “Fossil Flora.”

Near the junction of the Little River with the St. George River, the following section is seen :—

	FEET. INCHES.	
Coal, good	0	7
Dark grey shales...	0	6
Coal, good	0	7
Dark shales	1	0
Decomposed carbonaceous ironstone	0	3
Coal, fair	0	7
Grey shales...	0	4
Dark gnarled shales	0	3
Grey shales and sandstones, with a few bands of oolitic ironstone (1 to 2 inches) and marks of fossil trees ...	20	0

This coal, on analysis, gave much better results than any of the thicker seams. In fact, it is a coal which, if of workable thickness, would take a high place among coals used for steam and smelting purposes.* The following is the analysis :—

Water	2·763
Volatile hydrocarbons	26·197
Fixed Carbon	62·998
Ash	8·042
Sp. gr. 1·32.	
	<u>100·00</u>

STEWART'S CREEK, TOWNSVILLE.

At the $6\frac{1}{2}$ mile peg on the Northern Railway, near Townsville, a cutting exposes some beds of conglomerates, sandstones, shales, and fireclays, which have yielded *Glossopteris*. A sheet of porphyry is intruded among the strata. Similar beds are seen on the Aboriginal Reserve. And a dib driven horizontally into the beds (a very ineffective method of prospecting among horizontal strata) has exposed beds containing *Glossopteris* and *Sagenopteris* in large numbers.

A few of the adjoining land owners have commenced boring for coal in the large coast flats on the right bank of Stewart's Creek. The surface of the ground here is about 35 feet above the sea level. The drift has been found to be unexpectedly deep. It has been pierced in one place at a depth of 110 feet, and the bore is at present in hard fine grained siliceous sandstone at a depth of 142 feet. This sandstone is believed to belong to the coal measures.

PALMER RIVER.

In Notes on the Geology of Hann's Exploring Expedition, with which Mr. Norman Taylor has obligingly furnished me, the following passages occur :—“ At Camp 16 on the Mitchell River (camp 78 on the return journey) I found in the river bed fragments and blocks of coal shales, with thin seams of bright coal, and on searching carefully I discovered pieces of a whitish indurated shale containing indistinct

* See “Report on the Little River Coalfield.” By Robert L. Jack. Brisbane : By Authority, 1882.

plant remains, and an undoubted fragment of *Glossopteris*. (The shales are identical with some in the Blue Mountains of New South Wales north of Wallerawang, and again at Tallawang north of Gul-gong). About a mile south of this camp is a low table-topped rise consisting of horizontal white and grey shales and a chertz-looking rock, with fragments and stems of plants, and traces of *Glossopteris*, in situ. This rests on porphyry, which forms a series of rocky hills, two miles further south, extending seven miles south-easterly to the foot of and overlooking some high table-topped carboniferous ranges (composed of sandstones, grits and conglomerates, with silicified wood) in that direction."

In view of this evidence I cannot help regarding the Mount Mulligan table-land on the Lower Hodgkinson (which I had formerly classed with the Desert Sandstone) as a continuation of Mr. Taylor's "Carboniferous Range."

DAWSON, COMET, AND MACKENZIE.

An enormous tract of country extending from 21° 30' to 26° 10' S. lat. is covered with strata which are apparently the equivalent of the Bowen River Coalfield.

Daintree remarks (Q. J. G. S. 28, p. 285) that numerous outcrops of coal have been observed on the above-named rivers.

From Cracow Creek on the Dawson (25° 30' S. lat.) Mr. Etheridge, Senior, detected in the Daintree collection:—

Chonetes Cracowensis, (sp., nov.) Eth.

Pleurotomaria rotunda, (sp., nov.) Eth.

The Rev. J. E. Tenison-Woods (Fossil Flora of the Coal Deposits of Australia, p. 53) found *Sphenopteris lobifolia*, *Morris*, near Cracow Creek. From Wealwandongara * Creek, Nogoia River, Mr. Etheridge detected in the Daintree collection:—

Productus or *Strophalosia*.

Streptorhynchus.

From the head of Roper Creek, east of Clermont, Mr. Etheridge detected in the Daintree collection:—

Streptorhynchus Davidsoni, (sp., nov.) Eth.

Spirifera striata, Martin.

„ *convoluta* (?) Phillips.¹

„ allied to *S. bisulcata*. Sow.¹

Productus (*Strophalosia*), Clarkei.¹

¹ In Mr. Daintree's list (p. 286), but not included in Mr. Etheridge's list.

The Rev. W. B. Clarke says:—†My own collections, received in 1874, from Queensland, contain some interesting additions, which arrived too late to form part of the Daintree collection. Among these specimens from the head of Bee Creek, Fort Cooper (near

* The only place I know with a name resembling this is Wealwandangie, South Springsure.

† Sedimentary formations of New South Wales (p. 33.)

Elphinstone), I find *Pecten*, *Spirifer*, *Trochus*, and magnificent specimens of *Productus*, and a variety of usually associated shells; and with them in the same brown ferruginous grit and shale-beds well depicted *Glossopteris*, and some other plants, one of which appears to be a *Dictyopteris*."

Mr. Clarke refers* to fossils from Mantuan Downs (south-west of Emerald), sent by him to Professor M'Coy, and pronounced by the latter to be *Productus*, like *P. calva*, and *Strophalosia*.

Mr. Clarke quotes (p. 34) a letter from Mr. Daintree, dated January 22, 1870, in which the latter says:—"That on the Mackenzie River, near the junction of the Isaacs, the coal measures are highly inclined—*Glossopteris* the common fossil; but running up Roper's Creek they gradually become horizontal, and at the top of the Roper's Creek watershed, horizontal beds of sandstone and sandy limestone are the only rocks exposed in section full of Hunter River fossils, *Producti*, &c."

The following are in the Queensland Museum, Brisbane:—

Actinocrinites (Dawson River)

Cyathophyllum (Banana Creek south of Rannes.)

Favosites „

Productus „

Sphenopteris, sp., Dawson River.

Taking the large coalfield as a whole, it has yielded the following fossils:—

PLANTÆ.

Glossopteris.

Dictyopteris (?)

Sphenopteris lobifolia, Morris, s. sp.

ACTINOZOA.

Cyathophyllum.

Favosites.

ECHINODERMATA.

Actinocrinus.

BRACHIOPODA.

Chonetes cracowensis, sp. nov. Eth.

Productus, or *Strophalosia*.

Productus (*Strophalosia*) *Clarkei*, Eth.

P. like *P. calva*.

Streptorhynchus.

Spirifera striata, Martin.

„ *convoluta* (?) Phillips.

„ allied to *S. bisulcata*, Sow.

PELECYPODA.

Pecten.

* "Q.J.G.S., vol. 18, p. 246."

GASTEROPODA.

Pleurotomaria rotunda (sp. nov.), Eth.

STYX RIVER.

Coal occurs in the valley of the Styx, Broad Sound.

CLERMONT DISTRICT.

Daintree describes in 1870 * the Cement Hill, near Clermont, whose auriferous wealth has again excited attention within the last few months, as follows:—

“At ‘The Springs,’ about sixteen miles from Clermont, the most interesting occurrence of gold, in a scientific point of view, was met with. A pebble conglomerate, 20 to 30 feet thick, has been sunk through, on to a bed of yellow shale, and payable gold found at the junction of the two strata. In the shale are beautifully preserved impressions of *Glossopteris*. This plant-bed has an inclination of 5 deg., and from the bottom of the only shaft not deserted at the diggings, a drive has been taken some 80 feet, following the dip of the ‘*Glossopteris* shale,’ and the overlying cement yielded gold enough to induce the owner of the claim to pursue the work with spirit. My impression is that these cements are really the representatives of the shingles of the great carboniferous sea. At ‘Hurleys,’ small patches of a sandy shale, with imbedded *Glossopteris* are also found, together with cement, similar to that at ‘The Springs,’ and even in this, carboniferous fossils can be detected.”

Coal is found at Blair Athole, a few miles west of Cement Hill. One good seam is 2 to 3 feet thick.

BURRUM COALFIELD.

The reports of Mr. A. C. Gregory form the most important contributions to the literature of the Burrum River coalfield. The following is taken from his “Report on the Burrum Coal Mines.” Brisbane: By Authority, 1879:—

“The channel of the Burrum is cut through the upper horizontal sandstones into the carboniferous rocks, the banks being steep, and exhibiting the stratification and outcrops of coal for a distance of three miles downwards from the crossing of the road from Maryborough to Bundaberg.

“The surface of the country is formed by a horizontal sandstone, of much later date than the carboniferous deposits, and though the absence of fossils may render it difficult to give its correct geological position, it most probably belongs to the ‘Desert Sandstone.’

“So far as the exploration of the coal has been affected, the coal measures consist of thin bedded brown sandstones and shales. The average dip may be taken as 1 in 8 at the crossing of the Maryborough

* “General Report upon the Northern District.” By R. Daintree. Brisbane: By Authority, 1870, p. 3.

road, and gradually decreasing to 1 in 12 three miles to the north-east.

"The upper seam of coal which has been explored, is that worked in Beaufort and Howard's mines, on the left bank of the Burrum. These shafts cut the coal at about 50 feet from the surface, the seam being 4 feet thick, all good coal, nearly free from band.

"Under the Beaufort seam there is about 30 feet of sandstones and shales, then a second seam of $2\frac{1}{2}$ feet, known as 'Lapham's' seam, which was worked on the right bank of the river. There is then about 50 feet of sandstone and shale, a third seam of very hard coal, 1 foot thick, then about four feet of shales, and the main Burrum seam is reached. The coal in this seam is 4 feet thick in Whitley's shaft, about $1\frac{1}{4}$ miles to the north-west of the river, and 5 feet in the bank of the river where it was first worked.

"About 100 feet beneath the Burrum seam there is a fifth seam, known as 'Watson's' seam, 3 feet thick, which has been worked on the right bank of the river, and produced good coal.

"Four small seams, varying from 1 to 2 feet, exist below Watson's seam, with accompanying sandstone and shale, having a probable thickness of 500 feet when the North Hartley seam is reached, having a thickness of 4 feet of good coal, which was worked on the left bank of the river, a little below the crossing of the road.

"Under the last seam two small seams of $1\frac{1}{2}$ and 1 foot are visible, with 100 feet of sandstones, which form the rocky base on which the road from Maryborough to Bundaberg crosses the Burrum River.

"The carboniferous strata which are open to view present an aggregate thickness of about 1,000 feet, with five workable, and eight small, seams of coal, within an area of about 4 square miles, while there is evidence that the carboniferous formation extends north to the Burnett River, and south to Maryborough, though the seams yet discovered in these distant localities are not of sufficient thickness to be worked with profit.

"Geologically, the Burrum coal belongs to the palæozoic period, as *Glossopteris* is abundant in the fireclay which rests on the upper seam of the coal."

In spite of the scarcity of sections, there is so little doubt of the continuity of the 'coal measures' from Noosa to the mouth of the Kolan River, that I have no hesitation in including the whole district in the Burrum Coalfield.

In an older report,* Mr. Gregory says: "The slates and serpentine of Widgee and Kilkivan terminate at the watershed between Wide Bay and Munna Creek, on the road from Brooyar to Miva; and carboniferous rocks and boulder beds overlap the older rocks, except at a few points where granite and slate are visible, indicating that the carboniferous strata have no great thickness to the south of Munna Creek.

* On the geology of part of the districts of Wide Bay and Burnet. Brisbane: By Authority, 1875, p. 3.

"At the northern bend of Munna Creek, about two miles from its junction with the Mary River, there is a large outcrop of coal at the bottom of a high bank. The seam is 6 feet thick, with a band of 2 feet of black shale, and 2 feet of coal under the shale. The coal is covered by a thick bed of brown sandstone."

(In an appendix, Mr. Gregory gives the following analysis of the Miva coal:—

Volatile in coking, 23·6; fixed carbon, 61; ash, 15·4; coke, 76·4; carbon in coke, 80; Ash in coke, 20.)

"To the north-west the coal dips under beds of white clay, covered with coarse white and red sandstone, and it seems that the Miva coal is just on the south-east margin of the carboniferous formation, which occupies the lower valleys of the Mary, Burrum and Burnett Rivers. In the fine-grained sandstones over the coal, some fossil stems were found, varying from 1 inch to 6 inches in diameter, but altered to oxide of iron, similar to those common in the Ipswich coal beds. There were also imperfect traces of ferns, but all so imperfect as to be insufficient for the determination of the species."

Mr. Gregory further observes (*loc. cit*, p. 5): "On the south side of the Burnett River, about eight miles above Bundaberg, a seam of coal, 8 inches thick, is visible on the bank of the river. This is covered by about 80 feet of brown sandstones and shales, the top of which forms the level country near the Burnett River. The seam of coal where exposed dips to the south-west about 7 degrees; but the strata are nearly horizontal, a quarter of a mile to the north, where they show a good section on the steep bank of the river.

"Fossil impressions of plants are abundant; but with the exception of the bases of leaf stalks, and some fragments of the leaves of a plant allied to *Zamia*, or *Cycas*, none were found in sufficient preservation for the determination of species. As these remains of *Zamia*-like leaves are similar to those found in the coal beds of the Upper Brisbane, near Colinton, where they are associated with *Pecopteris*, *Teniopteris*, and *Otopteris*, it may be inferred that the Burnett and Brisbane River coal beds are of the same age.

"There are numerous outcrops of shales and other carboniferous rocks on the steep bank of the river ascending to Bingera Station, 12 miles above Bundaberg; and at the junction of Pine Creek, 3 miles higher up, three seams of coal are exposed in the face of the bank, which is about 100 feet high. These seams are only 6 to 8 inches thick and widely separated by shales and sandstones. Some good specimens of coal have been found at this point in the river drift, and indicate that there is a much thicker and better seam of coal below the water level.

"In the bed of Pine Creek $1\frac{1}{2}$ miles from its junction with the Burnett a seam of coal, 15 inches thick and of good quality, is exposed, and a shaft has been sunk at a spot 220 yards to the south of the outcrop. The coal dips 6 degs. to the south. About a mile higher up Pine Creek, there is another seam of coal, but it is only two or three inches thick."

In "Report on the Coal Deposits of the West Moreton and Darling Downs District," Mr. Gregory gives the following analysis of the Pine Creek Coal:—

Volatile in coking, 34·3; Fixed Carbon, 57·5; Ash, 6·2; Coke, 63·7; Carbon in Coke, 90·3; Ash in Coke, 9·7.

In "Geological Features of the South-Eastern Districts of Queensland" (Brisbane: By Authority, 1879), Mr. Gregory mentions (page 7) a coal seam at Tiaro on the Maryborough and Gympie Railway.

In Mr. Aplin's "Report on the Geological and Mineral features of a part of the Southern and Northern portion of the Burnett District" (Brisbane: By Authority, 1870), references are made to the occurrence of coal measures in several places, which have aided us in the mapping of the Burrum field.

The following section is given in a report by Dr. J. R. M. S. Robertson, M.E., F.G.S.:—

	DEPTH.	THICKNESS.
Bridge Seam	40 ft.	2 ft. 0 in.
Lapham „	220	3 0
Burrum „	255	3 6
Watson's „	395	3 6
Hartley's „	575	4 0

Dr. Robertson quotes the following analysis of the "*Torbanelea*" Seam by Dr. D. March:—

Ash	2·04
Carbon (fixed)	69·96
Gas, Oils, Tar, &c.	27·00
Sulphur	·90
Water (Hygroscopic)	·10
Heating Power, 99·96	
	100 00

The Rev. Julian E. Tenison-Woods* classes the Burnett River deposits as "Rhaetic or Lower Lias" and the Burrum deposits as "Upper Lias (?)" Of the latter he remarks (p. 18):—"I have seen no well-preserved plant remains from these beds, but they seem to me to be beneath the Ipswich coal seams and above those of Burnett River."

In the Proceedings of the Linnean Soc. of New South Wales, vol. vii. p. 95, the same author quoted *Phyllothea* (*indica* ?) as occurring in the Burrum beds. In the "Fossil Flora," however, he says (p. 38):—"I now wish to state that, after a careful examination, there is no evidence that these specimens belong exclusively to *Phyllothea*."

On p. 58 (*loc. cit.*) Mr. Tenison-Woods notes the abundant occurrence of *Sphenopteris* (*Aneimoides*) *flabellifolia* (sp., nov.) var. *erecta*, Tenison-Woods, in a blue shale on the Burnett River, "about half-way between Bundaberg and five coal seams which abut on the river."

* On the Fossil Flora of the Coal Deposits of Australia. Sydney, 1883.

On p. 96 (*loc. cit.*) the same author described a new species *Jeanpaulia bidens*, T.-Woods, from the Burnett River.

A *Sphenopteris* from Bundaberg is included in the collection in the Queensland Museum.

From the meagre list of fossils gathered from the writings of the above-named authors, two of the species being new, another doubtful, (though, if genuine, common to the Bowen River and Indian coal beds) and two not specifically determinable (though one—*Glossopteris*—is of a genus common to the Bowen River and Newcastle coal measures), it would be rash to form an opinion as to the age of the Burrum Coalfield. But two large collections, one made by my colleague, Mr. Wm. Henry Rands, and the other by myself, are now in the hands of Mr. R. Etheridge, Junior, for determination, and will be displayed at the Colonial and Indian Exhibition. It will be well to wait for the determination of these collections before assigning a distinct position in the geological scale to the strata under consideration. I may say that the plants of my collection appear to me to have a general mesozoic *facies*. Some of them appear to be identical with Ipswich forms. From the association of such plants with *Glossopteris* and *Phyllothea (indica ?)* I am inclined to regard the Burrum as occupying a position intermediate between the Bowen River and Ipswich coalfields.

Mr. Rands has recently observed strata belonging to the Burrum coal measures in Litabella Creek. This is the northmost outcrop of the series, so far as is known; but I think it more than likely that the level country adjoining Rodd's Bay is also covered with the same formation.

STEWART'S CREEK, WYCARBAH, AND ROSEWOOD, ROCKHAMPTON.

A very remarkable deposit occurs between the Central Railway at Stanwell and Mount Lyon. A vast series of bedded basaltic rocks is here met with, having a slight general dip to the north. Between and beneath the beds of basalt, dark carbonaceous shales, thin seams of impure coal and sandstones occasionally crop out. One ferruginous sandstone, near Mount Laurence Homestead, to which I was guided by Captain Christoe, in December, 1885, is full of well-preserved plant remains. *Glossopteris Browniana* is abundant, as is also *Taeniopteris Daintreei*. In one block the two plants, hitherto regarded as characteristic, one of the palæozoic, and the other of the mesozoic coal beds, lie side by side. *Sphenopteris* also occurs. The specimens will probably be displayed at the Colonial and Indian Exhibition.

This is undoubtedly the deposit alluded to by the Rev. J. E. Tenison-Woods, in a report to the Minister for Lands, dated 7th August, 1883 (published in the "Queenslander" newspaper), in the following terms:—"Proceeding westward from Rockhampton, the country consists of nearly level alluvial soil for some 20 miles. [Slates, &c., are, however, seen at intervals as far as Gracemere.—R. L. J.]

The few elevations that occur are of volcanic rock, with very rarely a few indications of stratified deposits. These strata are probably portions of the marine palæozoic carboniferous rocks, which are well represented by an abundance of fossils at what is called the Agricultural Reserve, at some distance north of the railway line. The fossils are mostly marine shells of well-known species, and as such, are found in the lower carboniferous rocks of Europe, especially in the North of Ireland. In Tasmania, beds of the same age are occasionally associated with seams of good coal."

At Wycarbah Railway Station, 24 miles from Rockhampton, a hard fine-grained volcanic tuff is associated with the basaltic rocks. This tuff contains numerous fern impressions, which appear to me to be of mesozoic types. A fine collection of these has been made by the zealous labours of Mr. James Smith of Rockhampton, and forwarded to Mr. R. Etheridge, jun., for identification, and will be displayed at the Exhibition.

Mr. Tenison-Woods refers to this deposit in the report to the Minister for Lands above quoted:—He says the fossils "are of great interest, showing a relation with certain mesozoic plant-beds of India, which have never hitherto been identified outside that country."

In "Fossil Flora" the same author refers (pages 20, 45, 113, and 125) to plant beds at Rosewood, West of Rockhampton, containing *Ptilophyllum oligoneurum* (sp. nov.), T. Woods.

Vertebraria towarrensis (sp. nov.), T. Woods.

Sequoiites (?) *australis* (sp. nov.), T. Woods.

Pecopteris.

Equisetum.

Regarding the Stewart's Creek, Wycarbah, and Rosewood (Rockhampton) deposits, as a whole,* it appears to me that we have in them a formation of the utmost importance. It yields *Glossopteris* and *Tæniopteris*, regarded (since Daintree's paper was published in 1872) as characteristic, the former of the palæozoic, and the latter of the mesozoic coal measures, the "marine shells of well-known species found in the Lower Carboniferous rocks of Europe," mentioned by Mr. Tenison-Woods, and a rich flora of a mesozoic type. It seems probable that here we have a series of passage beds bridging the Gap between the Burrum and Ipswich coalfields.

It may here be remarked that nothing like an uninterrupted series, ranging from Devonian to Mesozoic, as has been imagined by some geologists, can be detected in Queensland. The Dotswood beds indeed overlie the Burdekin limestones conformably, but all of the other divisions above enumerated occur in unconnected areas. The Gympie beds do not rest on the Dotswood beds, but on slates, &c., probably of the age of the Burdekin beds. The Star beds rest on slate, gneisses, schists, and granites, possibly older than the Burdekin beds. The

* But for the absence of the Rev. J. E. Tenison-Woods (now travelling in Japan), I should have wished to consult him on many points regarding the stratigraphical relations of some of the deposits described by him.

Mount Wyatt beds rest on the upturned edges of fossiliferous slates and shales, regarded by Professor McCoy as Upper Silurian, but probably the equivalents of the Burdekin limestones. The Drummond beds lie on slates, &c., which are either of the age of the Burdekin beds or older. The Bowen River beds rest on slates and granites. The Little River and Oakey Creek (Cooktown) beds lie on vertical slates. The relations of the Endeavour River (Cooktown) and Stewart's Creek (Townsville) beds to the underlying rocks are at present unknown. The "Dawson," "Comet," and "Mackenzie" beds rest on slates of Burdekin age or older. So do the coal-bearing beds of the "Styx," Clermont, and Burrum; and so do the Stewart's Creek, Wycarbah, and Rosewood (Rockhampton) beds. It thus appears that from the Dotswood beds upwards, each of the formations already described is separated from that which, on palaeontological grounds, is placed next in order to it, by a great unconformability. The record is very far, indeed, from being complete.

CHAPTER VII.

IPSWICH BEDS.

MR. A. C. GREGORY, C.M.G., in an official report,* has given a very valuable account of the coal and other beds of this district. He describes the coal seams of Old Moggill, Lyons, Goodna, Redbank, Six Mile Creek, Thomas', Portion 252 Goodna, Thomas' new mine, Thompson's, Bundanba, Mehi Creek, Eastwood, Tivoli, Blond and Wright's, Gulland's Rocky Crossing (Brisbane River), Walloon, Rosewood (Southern and Western Railway), Blackfellows' Creek, Flagstone Creek (near Toowoomba), Murphy's Creek, Spring Creek, Hodgson's Creek, Clifton, Allora, and Farm Creek.

Mr. Gregory remarks (p. 7) that "the general character of the coals found between Woolloon and Warwick is that of Cannel Coal. It does not cake in coking; gives a large percentage of gas, or oil and paraffin, according to its treatment at a high or low temperature. Its hardness renders it very suitable for export. It burns very freely, and leaves a soft white ash.

"From the small proportion of fixed carbon, and its not caking, it does not produce good coke, but a charred coal, which, however, burns well; consequently it is not well adapted for blast furnaces,

* On the Coal deposits of the West Moreton and Darling Downs Districts. Brisbane: By Authority, 1876.

though well suited for reverberatory furnaces. As a steam coal it is best suited for stationary or marine engines, the strong blast of locomotives being apt to blow it through the tubes. It is a very high-class household coal.

"In the Ipswich division the coals are bituminous, coking well; the proportion of gas being small, and the fixed carbon large, they are suited for forges and blast furnaces; are good steam coal when not broken too small; but are so friable as not to bear carriage well, and suffer from exposure to wet; so that the harder varieties, though containing most ash, are found in practice to be most economical, in consequence of the smaller proportion of waste.

"In both districts the coal is associated with ironstone bands and beds of boulders, consisting of concretions of oxide of iron, which have replaced fragments of fossil wood. The high percentage of ash in the coal, and scarcity of good limestone, would, however, be serious obstacles to the profitable working of the iron at the present low prices at which it is imported.

"On part of the North and East, and also on the South, the carboniferous rock rests on Devonian slates, sandstones, and limestones, and at a few points, on the granite.

"There are extensive tracts of the carboniferous formation covered by basalt, which is most extensively developed in the central part, where it forms the summit of the Great Dividing Range; and in the southern part there are erupted masses of felstone porphyry, forming high peaks, such as Mount Flinders, and at Cunningham's Gap, on the Main Range; but the coal measures do not appear to be much disturbed or altered by these outbursts of igneous rocks, while the manner in which the basalt covers the slabs and sandstones indicates that considerable erosion and denudation had occurred prior to the basaltic period.

"Resting on the Brisbane slates and Lucky Valley *Spirifer* sandstones and limestones, which have been classed as Devonian, and covered by volcanic rocks, of a comparatively recent geological period as is evidenced by the fossil plants found beneath it; the carboniferous strata might, so far as the evidence of conterminous rocks is concerned, occupy any position from the older carboniferous to the Oolite: And it is only by the *contained* fossils that the real age can be ascertained.

"*Pecopteris* is the leading feature of the fossil flora, and is found in all the shales of this Coalfield. *Sphenopteris* occurs in the Ipswich beds; and *Taeniopteris* at Ipswich and Colinton—at the latter place accompanied by *Pterophyllum*: *Vertebraria* at Spring Creek Darling Downs.

"In addition to the above, there are fragments of many other plants, but, not in a sufficiently perfect state for their determination. Fossilized wood is very abundant, and the structure indicates that much was coniferous. There are also many short stems, from 1 to 5 feet long and 2 to 6 inches thick, the terminal summits of which are rounded like tree-ferns or cycas, while the basis of large palm-like

leaves closely resembling the existing *Zamia* in form were found near Laidley.

"The presence of these plants, more especially *Taeniopteris* indicates that the coal is of a later age than the Palaeozoic Carboniferous formations, and that it should rather be classed as belonging to the Mesozoic Oolite.

"The superincumbent basalt is of a much later period than the coal deposits, as shown by the fossil wood and leaves found in the stratum of earth, between the basalt and the coal shales of the Clifton Mine, while no fragments of basaltic rock have been found among the coal strata; and there is evidence that the general features of the country were much altered during the interval between the last deposit of coal and the earlier outbursts of basalt."

Mr. Gregory gives the following table of analyses of the coals of this series:—

MINE OR LOCALITY.	Thick- ness.	Volatiles in Coking.	Fixed Carbon.	Ash.	Coke.	Carbon in Coke.	Ash in Coke.
Tivoli Mine, North Ipswich	5-6'	26·7	66·4	6·9	73·3	90·6	9·4
Eastwood Mine, North Ipswich... ..	7'	25·0	63·0	12·0	75·0	84·0	16·0
Thompson's Mine, Bundanba	5'	31·7	62·3	6·0	68·3	91·2	8·8
Goodna Mine, Woogaroo	4½'	28·8	62·2	9·0	71·2	84·4	12·6
New Mine, near Tivoli Mine	6'	30·8	61·0	8·2	69·2	88·2	11·8
Thomas' Mine, Bundanba	4-5'	29·8	59·2	11·0	70·2	84·3	15·7
Aberdare Mine, Goodna	...	28·8	57·2	14·0	71·2	80·3	19·7
Blond & Wright's Mine, North Ipswich	...	26·2	56·4	17·4	73·8	76·4	23·6
Lyons' Shaft, Moggill	3-4'	38·2	51·0	10·8	61·8	82·6	17·4
Brisbane River Seam, Rocky Crossing	...	22·0	50·9	27·1	78·0	65·3	34·7
Flagstone Creek, Helidon	...	36·3	47·4	16·3	63·7	74·4	25·6
Blackfellows' Creek, West Moreton...	9'	42·4	45·6	12·0	57·6	79·2	20·8
Hodgson's Creek, Darling Downs	...	44·7	42·6	12·7	55·3	77·0	23·0
Clifton Mine, Darling Downs	4-5'	47·6	42·2	10·2	52·4	80·5	19·5
Walloon, West Moreton	...	47·0	36·0	17·0	53·0	67·9	32·1
Murphy's Slam, Kedron Brook	...	16·0	33·6	50·4	84·0	30·0	70·0
FOR COMPARISON.							
Waratah, Newcastle, N.S.W.	...	31·0	62·5	6·5	69·0	90·6	9·4

In a report "On the Geological Features of the South-eastern District of the Colony of Queensland." (Brisbane: By Authority, 1879.) Mr. Gregory gives the following additional analyses:—

	Fixed Carbon.	Fluid Hydro- Carbon.	Water.	Equivalent to Combined Oxygen.
Tivoli, Ipswich	72½	...	...	...
Waterstown, Ipswich	69 to 71	7½	1½	1½
Redbank, Goodna	67 to 76	6	2½	2
Jones, Bundanba	68 to 77	...	...	...
Thompson's, Bundanba	66	...	...	...
Thomas', Bundanba	66	...	...	...

And the following interesting table:—

Economic value of Queensland coals and woods as fuel; also, of coal from Newcastle, New South Wales. Samples being taken from large commercial parcels, and a two-horse power vertical engine, worked for one day with each, and the results reduced to the quantity of water evaporated, from 75° to steam at 20lbs. per square inch, by 100lbs. of fuel.

DESCRIPTION OF FUEL.	Water in lbs. Evaporated by 100lbs.	Ash, lbs.	Cinders, lbs.
Gulland's Tivoli, Ipswich	562	11	3
Bryden's Eclipse, Ipswich	562	14	5
Clifton	522	13	0
Lyndsay's, Ipswich	510	12	12
Thomas', Bundanba	507	15	5
Redbank, Goodna	500	25	5
Waterstown, Ipswich	499	18	4
Smith and Levinges', Walloon	457	15	1
Jones', Six-mile Creek	416	21	4
Newcastle, New South Wales	505	7	7
Bloodwood	296	$\frac{1}{2}$	...
Swamp Mahogany... ..	281	$\frac{1}{2}$	...
Forest Oak (Casuarina)	265	$\frac{1}{2}$	...
Broadleaf Box... ..	251	$\frac{1}{2}$	...
Stringybark	249	$\frac{1}{2}$	...
Ironbark	247	$\frac{1}{2}$	...
Grey Gum	242	$\frac{1}{2}$	...
Spotted Gum	238	$\frac{1}{2}$	...
Common Wattle	218	$\frac{1}{2}$	...
Gum-topped Gum	218	$\frac{1}{2}$	...
Appletree... ..	199	$\frac{1}{2}$	...

Mr. William Carruthers, in his appendix to Mr. Daintree's paper,* gives the following list of plants from the Tivoli coalmine:—

Taeniopteris Daintreei, McCoy.

Cyclopteris cuneata, sp. nov., Carr.

Sphenopteris elongata, sp. nov., Carr.

Pecopteris odontopteroides, Morris.

Cardiocarpum australe, sp. nov., Carr.

The Rev. Julian E. Tenison Woods, in his "Fossil Flora," gives the following list of plants from the Ipswich coalfields:—

Equisetum rotiferum, sp. nov., T. Woods (Walloon).

Verterbraria equiseti (believed to be rhizome of *Equisetum rotiferum*), T. Woods (Tivoli).

Phyllothea carnosa, sp. nov., T. Woods (Walloon).

Sphenopteris elongata, Carruthers (Tivoli).

Sphenopteris (Aneimioides) flabellifolia, sp. nov., T. Woods (var. *erecta*).

Trichomanides laxum, sp. nov., T. Woods (Rosewood Scrub, Ipswich).

T. spinifolium, sp. nov., T. Woods (Rosewood Scrub, Ipswich).

Thinnfeldia media, sp. nov., T. Woods (an. var., *indica* (?)).

* Notes on Fossil Plants from Queensland (Q.J.G.S., vol xxviii., p. 350).

- T. australis* (not described. Locality not given).
T. odontopteroides, Feistmantel (Tivoli, Bundanba).
 " " var. *falcata* (Rosewood Scrub, Ipswich).
Cyclopteris cuneata, Carruthers (Tivoli).
Alethopteris australis, Morris (Ipswich).
Taeniopteris Daintreei, McCoy.
T. Carruthersii, sp. nov., T. Woods (Tivoli).
Angiopteridium ensis, Oldham (Rosewood, Ipswich).
Podozamites lanceolatus, Lindley and Hutton (Ipswich).
Brachyphyllum australe, var. or sp. nov., *crassum*, T. Woods (Ipswich).
Cunninghamites australis, sp. nov., T. Woods (Rosewood, Ipswich).
 There is every reason to believe in the identity of the Ipswich beds with the Clarence River beds of New South Wales, and in their strong Jurassic facies. There appears to be no break in the continuity of the Ipswich beds with the great "Rolling Downs formation."
 The following are in the Queensland Museum, Brisbane:—
Taeniopteris, sp. (Tivoli).
T. Daintreei, Carr. (Cresbrook Creek and Colinton).
T. Brisbaneensis (Denmark Hill, Ipswich).
Cyclopteris cuneata, Carr. (Tivoli, Woogaroo (Goodna), and Sandy Creek, Brisbane River).
Pterophyllum (?) (Brisbane River).
Neuropteris (Stanley, Main, Normanby, Ipswich).
Sphenopteris elongata, Carr. (Tivoli).
Pecopteris dentata (Stanley Main, Normanby).
P. australis, Morris (Elbow Vale Coalmine).
P. Drumori (Brisbane and Ipswich Railway).
P. australe (Denmark Hill).
P. odontopteroides, Morris (Tivoli, Denmark Hill, Sandy Creek).
Cardiocarpum australe (Tivoli).

CHAPTER VIII.

ROLLING DOWNS FORMATION.

In following the course of the Brisbane railway, the Ipswich beds are succeeded to the West by a series of grey shales, brown and greenish-grey sandstones, often calcareous, with occasional limestones. It is by no means a mountain-forming formation. Generally, the waste of the shales forms a rich soil, which is taken possession of by the nutritious "Mitchell" and "Blue" grasses, so highly favourable to the rearing of sheep and cattle. In this soil blocks of sandstone occasionally appear, the remnants of denuded beds. The surface rises

into a series of gentle undulations, not, however, of sufficient importance to disturb the idea of a dead-level. Travelling on the downs becomes monotonous after a few days. The sun rises and sets over the edge of the ocean-like plain. Water-courses are dry for the greater part of the year (except for a few holes in their beds), and are so ill defined that it is difficult at times to tell which way the water flows. They are marked by a straggling fringe of timber, while the rest of the plains are treeless. As the streams are of this character it is natural that they rarely cut through the soil, and consequently sections of the strata occur only at wide intervals.

To draw a definite line between the Ipswich and the "Rolling Downs" beds is quite impracticable. The appearance of belemnites and ammonites generally marks the transition.

Although mainly a marine deposit, plant beds and coal seams indicating fresh water, or terrestrial conditions, are by no means rare. The greater part of the surface of the division known as "Ayrshire," near Winton, is covered by fresh-water beds. At one time I indulged the hope of being able to separate a lower, or marine, from an upper or fresh-water series; * but recent explorations have satisfied me that this is impracticable, plant beds and coal seams being met with at different horizons, and not being identifiable over large areas. It may be said that I have not seen a single plant from the Rolling Downs in determinable condition. The shales on which they are imprinted crumble rapidly on exposure. Mr. Gregory, however, mentions ("Report on the search for coal between Dalby and Roma." Brisbane: By Authority, 1879) that many well-preserved specimens of ferns, including *Taeniopteris* and *Pecopteris*, were found in an ironstone bed in Bungeworgorai Creek, 10 miles above the main Western road, and a *Sphenopteris* from the Bulloo River, in the south-west corner of the colony, is included in the collections in the Queensland Museum.

A seam of coal three or four inches thick was cut in a well on the boundary of Werna and Ayrshire Downs runs, north of Winton, at the depth of 140 feet. A second thin seam was cut between 140 and 180 feet. The following analyses show the first seam to be very near in composition to the Lesmahagow Cannel coal, Lanarkshire.

WERNA COAL.†				LESMAHAGOW COAL.			
Carbon ...	...	...	39·07	...	...	...	39·40
Volatile ...	...	...	55·96	...	...	...	56·60
Ash ...	...	...	4·97	...	...	...	4·00
100·00				100·00			

* See "Report on the Geological features of part of the district to be traversed by the proposed Transcontinental Railway." Brisbane: By Authority, 1885.

† Transcontinental Railway Report, p. 20.

In the Government well, Winton, a coal seam 15 inches thick was struck at 70 feet, and another seam, 2 feet thick, at 100 feet.* The following is an analysis of this coal:—

Carbon	...	...	...	52·49
Volatile	...	...	...	42·93
Ash ...	...	...	...	4·58
				100·00

In Sheppard's Well, Winton, a coal seam, seven inches thick, was struck at 80 feet, and another, 2 feet thick, at 121 feet. The following is an analysis of the latter:—

Carbon	...	...	...	30·32
Volatile	...	...	...	49·34
Ash ...	...	...	...	20·34
				100·00

At Vindex Station, east of Winton, a 9-inch coal seam was cut in a well at 75 feet, and other two seams (the upper one 16 inches thick) between 75 and 100 feet.

Seven miles N., 15° E. of Vindex, a coal seam, 2 feet thick, was struck in a bore for water, at a depth of 130 feet.

Coal has been found at Milta, east of Tambo (three seams in 36 feet, one seam 3½ feet thick) and on the head of Bungeworgorai Creek, north-east of Mitchell (a thick seam) and at Dulbydilla, the present western terminus of the Brisbane railway. In the latter place, in a bore put down for the Railway Department, by Mr. Falconer, grey shales, with small seams of coal, lignite and decomposed coal, were met with from 28 feet to 83 feet 6 inches. At 350 feet a 3-feet seam of good coal lay beneath a series of green sandstones, 120 feet thick.

Many beds of gypsum occur in the Downs formation. One of workable thickness, and of great purity, occurs near Collingwood.

Near Fort Bowen, on the Saxby River, a spring of hot water rises above the surface of the plain. Its overflow deposits a white incrustation which gave the following analysis:—

Water	...	...	...	27·793
Silica	...	...	...	0·600
Chlorine	...	...	...	3·369
Sodium	...	...	...	2·183
Carbonic Acid	...	...	...	33·735
Soda	...	...	...	31·690
				99·370†

The fossils of the Rolling Downs formation have given rise to much controversy among geologists and palaeontologists, who have pronounced various localities, from limited collections, to be of ages

* Loc. cit., p. 17.

† Daintree, *Q. J. Geol. Soc.*, vol. xxviii, p. 285.

ranging from Rhaetic up to Lower Chalk. It is remarkable that almost every palaeontologist who has worked on Queensland materials, has come to the conclusion that fossils from different localities must have been mixed up, and this explanation has appeared to be specially necessary in the case of fossils from the Rolling Downs. On the other hand, my own explorations have satisfied me that Queensland fossils are not more liable to this kind of accident than fossils from other countries; that the mixing up which has so annoyed palaeontologists has been perpetrated by nature herself; that we have a continuous series of beds of enormous thickness in which, however, from the scarcity of sections, it would be impossible to map out "horizons;" and that the fossils from the Rolling Downs must be treated as a whole. Shading gradually upwards from the plant-bearing Ipswich beds, the Rolling Downs formation contains a marine (and occasionally freshwater) fauna, representing the migration of many species which in Europe date from Rhaetic to Cretaceous, but which cannot be quoted as arguing a strict contemporaneity of life.

The palaeontology of the "Downs" was ably brought up to date (1872) by Mr. R. Etheridge, senior, in his "Description of the Palaeozoic and Mesozoic Fossils of Queensland."*

In 1862 the Rev. W. B. Clarke† noticed a suite of fossils collected between the Balonne and Maranoa rivers. They were collected by Mr. W. P. Gordon, from Wollumbilla Creek (25 miles east of Roma), Amby River (18 miles east of Mitchell), and Fitzroy Downs (between Wollumbilla Creek and Mount Abundance). On being submitted to Professor McCoy, they were named as follow, and pronounced "not younger than the base of the Great Oolite, and not older than the base of the Trias":—

1. *Serpulae* (gigantic).
2. *Pentacrinus*.
3. *Monotis* (Lias. ?).
4. *Pecten* (Lias. ?).
5. *Lingula*.
6. *Myacites*.
7. *Avicula*, new species of the section *Meleagrina*.
8. *Lima*.
9. *Turbo*.
10. *Natica*.
11. *Rhynchonella*.
12. *Monotis* (Saliferian ?).
13. *Pecten* (Muschelkalk ?).
14. *Myophoria*, a typical new species (Muschelkalk ?).
15. Lamellibranchiate bivalve, of a new genus, between *Modiola* and *Pachydomus*.
16. *Mæonia* or *Astartilia*.
17. Lamellibranchiate bivalve, of a new genus.

* Q. J. Geol. Soc., London, vol. xxviii, p. 317.

† Q. J. Geol. Soc., London, vol. xviii, p. 244.

18. *Avicula*.
19. Small *Orthoceras* (?)
20. *Belemnites*, like *B. giganteus*, and proposed by Mr. Clarke to be called *B. Barklyi*.
21. *Arca*.
22. *Nucula*.
23. *Modiola*-like shell.
24. Fossil wood.
25. Lamelliferous Coral (very like a fossil from the Wianamatta beds, N.S.W.)
26. Fossils very like fish-teeth, but considered by Professor McCoy to be the spines of probably the suckers of No. 20.
27. *Scalpellum* (?).
28. Sponge
29. *Belemnites* (like *B. paxillosus*).
30. *Dentalium*.

Professor McCoy, in 1866,* named the following fossils from the Flinders River, at the base of Mount Walker, near Hughenden:—

REPTILIA.

Ichthyosaurus australis, McCoy.

Plesiosaurus Sutherlandi, McCoy (allied to that from New Zealand described by Professor Owen).

P. macrospondylus, McCoy.

CEPHALOPODA.

Ammonites Sutherlandi, McCoy (resembling *A. Barandieri* of the Gault of France).

A. Flindersi, McCoy (resembling *A. Beudanti*, Br. of the Lower Chalk of France).

Belemnites diptycha, McCoy (resembling *B. plena* of the Lower Cretaceous beds of England).

Ancycloceras Flindersi, McCoy (equalling *A. giganteus* of the Lower Greensand in size, but more nearly resembling in structure *A. Faborelli* of the Lower Greensand of France).

LAMELLIBRANCHIATA.

Inoceramus Carsoni, McCoy (resembling *I. mytiloides*, Sow. of the Chalk of England).

I. Sutherlandi, McCoy (identical with the English species *I. Cuvieri*).

Mr. Charles Moore, F.G.S., in an important paper read in 1869,† describes a suite of fossils sent to him by the Rev. W. B. Clarke, from Wollumbilla, Fitzroy Downs, Mitchell Downs (Amby River), Nive River, Upper Maranoa west of Bendango, Mount Abundance, Blythdale (15 miles from Wollumbilla), and Bungeworgorai. The following is his list:—

* Trans. Roy. Soc. Victoria, vol. vii, p. 49.

† Q. J. Geol. Soc. London, vol. xxvi, p. 226.

PLANTÆ.

Wood. two. sp.

AMORPHOZOA.

Purisiphonia Clarkei, sp. nov. Bowerbank (Wollumbilla).

FORAMINIFERA.

Planorbulina Ungeriana, D'Orb.

P. lobatula, D'Orb.

Cristellaria acutauricularis, Ficht. and Moll.

C. acutauricularis var. *langicostata*, Moore (Wollumbilla).

C. cultrata, var. *radiata*, Moore.

Polymorphina lactea, W. and J.

P. gibba (?) D'Orb.

Dentalina communis, D'Orb.

Vaginulina striata, D'Orb.

ECHINODERMATA.

Echinus, (spines), (Wollumbilla).

Pentacrinus australis, Moore. (Wollumbilla and Mitchell Downs).

ANNELIDA.

Serpula intestinalis, Phillips.

CRUSTACEA.

Balanus, sp.

Sp. of sub. class *Entomostraca*.

POLYZOA.

Lepralia oolitica, Moore. (Wollumbilla).

Polyzoon. sp.

BRACHIOPODA.

Lingula ovalis, Sow.

Rhynchonella, rustica, Moore. (Wollumbilla).

R. solitaria, Moore. (Wollumbilla).

Terebratella Davidsonii, Moore. (Wollumbilla).

Argyope Wollumbillaensis, Moore. (Wollumbilla).

A. punctata, Moore. (Wollumbilla).

Discina apicalis, Moore (Wollumbilla).

LAMELLIBRANCHIATA.

Avicula Braamburiensis, (Phillips).

A. simplex, Moore. (Wollumbilla).

A. aequalis, Moore. (Wollumbilla).

A. Barklyi, Moore. (Wollumbilla).

A. substriata, Moore. (Wollumbilla).

A. reflecta, Moore. (Wollumbilla).

A. umbonalis, Moore. (Wollumbilla).

A. corbiensis, Moore. (Mount Corby).

A. sp. (Wollumbilla).

- Lima Gordonii*, Moore. (Wollumbilla).
L. sp.
L. sp.
L. multistriata, Moore. (Wollumbilla).
Pecten aequilineatus, Moore. (Wollumbilla).
P. socialis, Moore (Wollumbilla).
P. fimbriatus, Moore. (Wollumbilla).
P. gigantea, (Wollumbilla).
P. sp.
P. sp.
Cytherea Clarkei, Moore. (Maranoa River, and Wollumbilla).
C. gibbosa, Moore. (Wollumbilla).
Thracia Wilsoni, Moore. (Amby R. and Bungeworgorai Creek).
Panopæa rugosa, Moore. (Bungeworgorai Creek).
Mya Maccoyi, Moore, (between Amby and Maranoa River).
Trigonia lineata, Moore, (Wollumbilla).
Perna gigantea, Moore, (Wollumbilla).
Arca plicata, Moore, (Wollumbilla).
A. prælonga, Moore, (Wollumbilla).
Astarte Wollumbillaensis Moore, (Wollumbilla).
Cardinia, sp.
Cardium, sp.
Goniomya depressa, Moore, (Wollumbilla).
Leda australis, Moore, (Wollumbilla).
Lucina anomala, Moore, (Wollumbilla).
L. (?) australis, Moore, (Wollumbilla).
Mactra trigonalis, Moore, Nine River.
M. sp.
Modiola unica, Moore, Wollumbilla.
Myacites planus, Moore, Wollumbilla.
Mytilus inflatus, Moore, Wollumbilla.
M. rugo-costatus, Moore, Wollumbilla.
M. planus, Moore, Wollumbilla.
Nucula Cooperi, Moore, Wollumbilla.
N. truncata, Moore, Wollumbilla.
N. sp.
Tancredia plana, Moore, (Blythesdale).

GASTEROPODA.

- Natica variabilis*, Moore, (Wollumbilla).
N. ornatissima, Moore, (Wollumbilla).
N. sp.
Actæon Hochstetteri, Moore, (Wollumbilla).
A. depressus, Moore, (Wollumbilla).
Delphinula reflecta, Moore, (Wollumbilla).
Dentalium lineatum, Moore, (Wollumbilla).
Solarium ? sp.
Trochus, sp.
Turbo. sp.

CEPHALOPODA.

Crioceras australe, Moore, (Upper Maranoa).

Belemnites paxillosus (?) Voltz.

B australis, Moore, (Upper Maranoa).

B, sp.

B, sp.

Teuthis, sp. (Wollumbilla).

PISCES.

Hybodus ? (teeth and scales).

Lepidotus, (scales).

In M. R. Etheridges' appendix. to Mr. Daintree's paper, the following fossils are described :—

LAMELLIBRANCHIATA.

Inoceramus Marathonensis sp. nov. Eth. (Marathon Station, Flinders River).

I. multiplicatus, Stol. var. *elongatus* Eth. (do., Flinders River).

I. pernoides, sp. nov. Eth. (do., Flinders River).

I. allied to *I problematicus*, D'Orb. (do., Flinders River).

Avicula (*Ancella*) *Hughendenensis*, Eth. (Hughenden).

CEPHALOPODA.

Crioceras or *Ancyloceras*.

Ammonites Sutherlandi sp. nov. Eth. (McKinlay Range).

A. Beudanti, Bong, var. *Mitchellii*, Eth. (Hughenden).

A. Daintreei, Eth. (Hughenden).

Belemnites, two or three sp. (Belcombe Creek, Black Downs).

PISCES.

Aspidorhynchus, sp. ?

One new species and seven genera not specifically determined, (included in the Daintree Collection) marked "Gordon Downs," are given in Mr. Etheridges list as "Oolitic," but are here omitted, as if this is Gordon Downs, on the head of the Roper, near Clermont, there is reason to believe that the deposit belongs to the Dawson Coal measures.

Sir Richard Owen, K C.B., describes in the Quarterly Journal of the Geological Society of London (vol. 38, p. 178), under the name *Notocheles costata*, a chelonian reptile from the Flinders River.

In accompanying Hann's Exploring Expedition in 1872, Mr. Norman Taylor discovered richly fossiliferous deposits in the Walsh district. From notes which he has obligingly communicated to me I make the following extracts :—

"At Camp 11 on the Walsh River a large quantity of Mesozoic fossils were also found, and likewise at Camp 79 (return journey). At Elizabeth Creek (near what is now Wrotham Park Station), where mostly belemnites were found in a calcareous conglomerate. In a creek, a short distance to the N.E. of Camp 31, on the Walsh River

(return journey), there occur large quantities of ironstone nodules, in one of which I discovered a fine and very perfect crustacean, which, however, appears to have been lost, as it was not noticed by Mr. Etheridge when describing the collection. The Mesozoic rocks here rest on grey felsitic quartz-porphry.'

"In a letter from the late Rev. W. B. Clarke to myself, dated 4th June, 1874, he says:—'Professor Etheridge says there is no specimen of *Orthoceras* in the entire series.'

"Carruthers writes thus:—'There is not sufficient to warrant establishing a species, but the fragments point to a form of *Taeniopteris* nearly allied to *Stangeritesensis* (Oldham and Morris in Indian Survey Memoirs), which Schimper calls *Angiopteridiensis*. We must have more materials, however, before we can be certain.'

"The following is an extract from a letter of Mr. Theodore Staiger, formerly Curator of the Queensland Museum, dated 18th May, 1874, giving Mr. Etheridge's description of the Walsh River fossils:—

"The Walsh River fossils consist of the following forms:—

CEPHALOPODA.

Ammonites, allied to *A. clypeiformis*.

Ammonites, sp (?)

Crioceri, 4 sp.

Belemnites, 2 sp.

All from nodules.

BI-VALVE SHELLS.

Myacites.

Byssosarcus.

Solemya.

Arca.

Panopæa.

Inoceramus.

Hinnites.

Cytherea.

Cyprina.

Myoconcha.

Pecten.

Teredo in fossil wood.

"I believe the whole of these are Cretaceous (Lower) and one perhaps Neocomian. Most of the species are new, but to figure and describe them would serve no good purpose, as they are all apparently in drift nodules, and can hardly have been found *in situ*. I shall always have much pleasure in rendering you what assistance I can in these matters, but I would at the same time point out the uselessness of sending home any fossils for determination which are simply drifted surface specimens. The perplexing mixture of forms from Wollambilla, previously described by Moore, arose from this collection of specimens from drifted nodules. The whole series will be returned to the colony.'

"No mention is made of some fine *Icthyosaurus vertebræ* discovered on the Walsh by Warner (one of our party), nor of my crustacean. Of the the *Orthoceras* I sent a drawing (natural size) to the late Rev. W. B. Clarke, and I still adhere to my opinion that it was an *Orthoceras*.

"The Mitchell River bed is composed (at Camp 14) of thin grey shales and brittle conchoidally fractured marly sandstones, full of large and small flattened globular concretions. The sandstones are full of *Dentaliums* (?) and small bi-valves (*Leda* ?); and the concretions of large bi-valves and cephalopoda (*Pecten*, *Ammonites*, &c.,) always lying on their flat surfaces. That they have been formed *in situ* by segregation of the calcareous matter round the decomposing animal there can be no doubt. The idea of their drift origin is simply preposterous, as you will say should you see them."

It is not surprising that Mr. Taylor should feel agrieved at the contemptuous treatment of his collection. Nodules such as he describes are of common occurrence among the shale-beds all over the Rolling Downs, and I have no doubt that the fossils were *in situ*, and am satisfied that to figure and describe them (if still extant, and I think I have recognised them in the Brisbane Museum), would be greatly to the advantage of science. Mr. Skene, of Wrotham Park Station, assures me that ammonites and belemnites occur at Elizabeth Creek *in situ*. I have already expressed my opinion that the mixing up of the Wollumbilla forms was done by nature, and not by Mr. Gordon. *Orthocera* is not at all uncommon in the Mesozoic beds of Aramac, and I have recently received a specimen from the Rev. T. W. Ramm, of Hughenden, which surely belongs to that genus.

In his paper "On a Collection of Fossils from the Bowen River Coalfield," &c., Mr. R. Etheridge, junior, described in 1880, under the name of *Crioceras Jackii*, a new species of Cephalopod, brought from the Tate River by Mr. A. C. Macmillan.

The following specimens from the "Rolling Downs" are in the Queensland Museum, Brisbane:—

Hamites or *Hamelina* (Towerhill).

Belemnites, sp. (Towerhill).

Hamites, sp. (Ward R.).

Belemnites, sp. (Ward R.).

Ammonites, sp. allied to *A. rhima*, Stol. (Barcoo River, near Tambo).

Ancylloceras, sp. (Rodney Downs, near Aramac).

A., sp. allied to *A. Theobaldinus*, Stol. (Bowen Downs, near Muttaborra).

Pinna, sp. (Bowen Downs, near Muttaborra).

Inoceramus pernoides, (Bowen Downs, near Muttaborra).

Aspidorhynchus, sp. (O'Connell Creek).

Icthyosaurus.

Vertebrae of Shark, (Richmond Downs).

In accompanying the Transcontinental Railway Expedition, in 1881-2, I made a collection of fossils from the Rolling Downs, which was sent to London. I am indebted to Dr. Henry Woodward for a

description of a new neuropterous insect [*Geological Magazine*, New Series, Decade 3, vol. 1, p. 337] and to Mr. Robert Etheridge, junior, for the identification and description (not yet published) of the rest of the fossils in the following list:—

PISCES.

	LOCALITY.
<i>Otodus</i> (fangs and tooth)	12
<i>O. apendiculatus</i> , Agassiz	16
Small vertebrae of a teleostean fish	16
<i>Lamna</i> (portion of tooth)	17

REPTILIA.

Posterior costal plate of a chelonian	16
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INSECTA.

<i>Æschna Flindersiensis</i> , sp. nov., Woodward	1
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LAMELLIBRANCHIATA.

<i>Ancilla Hughendenensis</i> , formerly <i>Liversidgei</i> (<i>Avicula Hughendenensis</i> of R. Etheridge, senior) 1, 7, 11, 12, 14, 15, 17	
<i>Pseudomonotis semi-globosa</i> , Stol. var.	11
<i>P. Rockwoodensis</i> , Eth.,	11
<i>Inoceramus Carsoni</i> , McCoy,	3, 5
<i>I. Sutherlandi</i> , McCoy,	3, 6
<i>I. Pernoides</i> , Eth.,	1
<i>I.</i> 3rd sp.,	3
<i>I.</i> undet.	
<i>I.</i>	2, 4, 10, 11, 13
<i>Amusium sulcatellum</i> , Stol. (var.)	11
<i>Unio</i> (sp. 1)	18
<i>Unio</i> (sp. 2)	19

GASTEROPODA.

<i>Natica</i> , sp. nov.,	8
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CEPHALOPODA.

Fragments,	8
<i>Belemnites</i> ,	9, 12, 19

LOCALITIES.

1. Flinders R., 7 miles above Marathon Station.
2. Flinders R., 7 miles below Marathon Station.
3. Flinders R., 3 miles above Richmond Downs Station.
4. Flinders R., at Richmond Downs Stockyard.
5. Flinders R., $13\frac{1}{2}$ miles below Richmond Downs Station.
6. Flinders R., $21\frac{1}{2}$ miles below Richmond Downs Station.
7. Neelia Creek, at the crossing of the Cloncurry Rd.
8. Cloncurry Rd., at Julia Creek.
9. Cloncurry Rd., 1 mile west of William R.
10. Cloncurry Rd., 8 miles west of William R.

11. Rockwood Station, Landsborough R.
12. Stone Hut, Rockwood Ck., Landsborough R.
13. Rockwood Ck., junction with Landsborough R.
14. Landsborough R., $5\frac{1}{2}$ miles N.N.W. of Rockwood Station.
15. Landsborough R. near the head of Jirking Ck.
16. Kamilaroy Station, Leichhardt R. (Limestone)
17. Leichhardt R., 9 miles from the mouth of Gunpowder Creek (Limestone).
18. Sheppards' Well, Winton.
19. Government Well, Winton.

Mr. Etheridge observes (MS. Notes), "We may conclude with moderate certainty that your Queensland beds are of upper cretaceous age, and perhaps represent that portion known as the lower chalk of England, and the Cenomanian Group of continental geologists."

In addition to the fossils last above described, a considerable collection has recently been made by me from Tambo, Blackall, Aramac, Nive River, Mitchell, and other localities in the Mitchell, Warrego, and Maranoa districts. Mr. Robert Sefton, the well-known explorer and prospector, has recently presented to the Geological Survey Collection a gigantic ammonite from the Walsh River, 15 miles above the telegraph station. Mr. R. Sexton, C.E., has presented a suite of fossils from the neighbourhood of Mitchell, which includes two specimens very like *Ammonites Beudanti*. Mr. Daintree mentions* the occurrence of *Belemnites* on the Dugald River, Cloncurry district.

In his Report, dated 14th December, 1884, on the Croydon Gold-field, Mr. Samwell thus refers to a fossiliferous region in the neighbourhood of the rush:—"Below Croydon station-house and the hill called 'the Springs' there are several isolated hills composed of fossiliferous rocks, in which are found great quantities of sea-shells, slugs, worms, etc. In one of these hills, which we particularly examined, we found, next to the sea-shells, impressions of sandstone showing the impressions of land-flora, ferns predominating. Near this sandstone, and partly intermixed, on a precipitous slope of the hill, are what appear to be limestone rocks. In these hard rocks are seen the tracks of birds and other animals, the fossil remains of fish and lizard-like reptiles, and flora of the most exquisite description."

It is evident that very important material is here available. Mr. Samwell has kindly promised to send me his collection of fossils.

Between Roma and the Gray Range, the Downs formation is covered in many places with the debris of the extensively denuded "Desert Sandstone." The open plains, so characteristic of the Downs further North, in such places is changed to stunted scrub or brushwood. Many of these scrubs are chiefly composed of mulga and boree—timber which during the drought, which has prevailed for the last three years, have saved the lives of thousands of cattle, which would otherwise have perished owing to the failure of grass. A little army

* Report on the Cape River diggings, and the mineral discoveries in Northern Queensland. Brisbane: By Authority, 1868.

of axemen has been at work felling the trees, whose leaves are much relished by stock.

The subject of an artesian water-supply for the West has recently engaged the attention of the Government. As the rainfall on the Downs themselves is not sufficient to saturate the strata, my belief is that a supply must be sought for at the junction of the "Rolling Downs Formation," and the underlying palaeozoic rocks. Such a supply would be drawn from the rains which fall on the palaeozoic ranges of the Eastern part of the colony. The first experiment is to be made at Blackall, with a Pennsylvanian beam borer capable of penetrating 2500 feet.

CHAPTER IX.

DESERT SANDSTONE.

THIS remarkable formation must at one time have covered at least three-fourths of the colony of Queensland, as well as a great part of South and Western Australia. The waters in which it was deposited, had for their eastern shores the cordillera of palaeozoic rocks, which look down upon the Pacific. The deposit filled up the inequalities of the denuded surface of the rocks of the "Rolling Downs;" while the Mackinlay and other ranges lifted their peaks as islands above the waters.

The base of the Desert Sandstone on the Western side of the Cordillera rests unconformably on the "Rolling Downs" formation, at an average elevation of about 1800 feet above the sea level. In the South-Western part of the colony its elevation is probably not more than 1000 feet. In the York Peninsula it steals gradually downward, till it reaches the sea at Temple Bay, and covers the Peninsula from the Pacific to the Gulf of Carpentaria. In the East, important fragments of the Desert Sandstone rest, at a considerable elevation, on the Bowen River coalfield, and on the auriferous rocks of Cania and Croombit. At Maryborough and Moreton Bay, sandstones which have been referred to the Desert Sandstone come down to the sea level. The formation has suffered extremely little disturbance. It is almost always found in horizontal beds, which form table-lands, with terraced edges. It consists mainly of siliceous sandstone and conglomerates. Among the sandstones thin beds of coal occur to the North of Cooktown. A thick bed of coal or oil shale has recently been discovered on Bullock Creek, near the Northern Railway. The sandstones are mainly white; but red beds are largely developed in

the York Peninsula. The latter form fair pastoral country, but the greater part of the formation justifies the name of "Desert Sandstone," given to it by Daintree. It grows, as a rule, worthless grasses, mainly spinifex, and is thickly covered with rather stunted timber.

Opals form the chief commercial product of this formation. They occur in nodules of feruginous siliceous sandstone and siliceous ironstone. Although the majority do not exactly meet the definition of "precious opal" insisted on by jewellers, they are not less beautiful. A change in popular fancy, or the eradication of prejudice, is all that is required to make the Queensland Opals as valuable as the most appreciated gems from Hungary. Among their chief sources are the Opal Range, the Winton, the Mayne River, the Canaway Range, Bulgroo, Nickavilla, and Listowel Downs. A fine collection is to be displayed by Mr. Bond at the Exhibition.

The Desert Sandstone attains a thickness of 300 to 400 feet on the West slopes of the Coast Range. In the West of the Colony, however, it dwindles to 50 or 60 feet.

The Desert Sandstone affords a most impressive instance of denudation. The most casual observer, standing on the edges of one of its table-lands, cannot fail to be struck with the obvious former connection of the terrace-edged table-lands which meet the eye on all sides. This formation, geologically so new, is left only in isolated fragments, and does not cover, in Queensland, one twentieth part of the area over which it once extended.

The desert sandstone has yielded little but plant remains, chiefly fragments of silicified wood. Mr. Norman Taylor, late of the Geological Survey of Victoria, who accompanied Hann's Exploring Expedition, however, found in it, at Battle Camp, near Cooktown, some fossils which Mr. Robert Etheridge, senr., described as "a *Hinnites* like *H. velatrix*, and an *Ostrea* like *O. Sowerbyi*, Eth." Mr. Etheridge, however, thought that the fossils were drifted specimens, lying on the surface; which Mr. Taylor assures me was not the case. In confirmation of Mr. Taylor I have the unquestionable testimony of Mr. A. C. McMillan that he himself had seen fossils in the locality referred to by the former gentleman. In any case, however, the fossils are insufficient by themselves to determine the age of the deposits.

In his paper on the Geology of Queensland the late Mr. R. Daintree first referred in 1872 to a series of rocks occurring at Maryborough, and containing fossils which, in the appendix to Daintree's paper, Mr. Etheridge, senr., named as follows:—

Cyprina expansa, Eth.

Trigonia nasuta, Eth.

Crenatula gibbosa, Eth.

Shell resembling *Lucina* (*Codallia*) *percrassa*, Stol.

Cucullæa robusta, Eth.

C. costata, Eth.

Nucula quadrata, Eth.

N. gigantea, Eth.

Tellina Mariaeburiensis, Eth

T. sp.

Avicula alata, Eth.

Natica lineata, Eth

Panopæa sulcata, Eth.

Mr. Etheridge placed the Maryborough beds (which lie in the Burrum River Coalfield) below the Hughenden and Marathon beds. There is, however, no stratigraphical evidence whatever in support of this, and it is obvious from the number of new species, that the co-relation of the Maryborough beds with any European horizon rests on very insecure grounds.

Mr. Gregory* says that the Maryborough beds merge upwards into the Desert Sandstone, which "appears as a thin covering to the older rocks along the sea coast from the Burnett River to the Logan River." If we could be sure of the identity of the "thin covering" with Desert Sandstone the relations of the Maryborough beds would be clearer; but the point is a doubtful one. I am inclined to regard the "thin covering" as a newer deposit than the Desert Sandstone—possibly post tertiary. But the solution of the difficulty must await the production of further evidence.

I have, in the meantime, coloured the Maryborough beds, provisionally, as Desert Sandstones, but the arrangement is merely a temporary convenience.

Leaving the Maryborough beds out of the question, the only direct evidence bearing on the age of the Desert Sandstone is that it lies unconformably on the "Rolling Downs" foundation. It may be the equivalent of the Upper Cretaceous.

In the arid Western interior the table-lands of Desert Sandstone serve one useful purpose. They are "sponges" which absorb the rainfall, and let it out in springs at their junction with the underlying more argillaceous rocks of the "Rolling Downs." Some of these springs were still active, at the end of 1885, after three years of drought.

CHAPTER X.

TERTIARY.

THE raised beaches near Brisbane and Townsville contain fossils which have been classed as tertiary. I find it, however, impossible to give a list which would be of any value in the present state of our knowledge.

* Geological Features of the South Eastern Districts of Queensland. Brisbane: By Authority, 1879.

Mr. A. C. Gregory, in his "Report on the Geological Features of the South-eastern Districts of Queensland." Brisbane: By Authority, 1879, refers to certain localities in which the "carbonaceous rocks of the Mesozoic period had been long exposed to erosive action, and had become covered by a vegetation which included plants of the tertiary period—as at Clifton mine on Darling Downs, where, under 30 feet of basalt, large pieces of fossil wood were found, so little altered that it split and warped several inches on being exposed to the air. It was associated with woody seed-vessels (*Conchotheca turgida*)."

It is probable that many of the auriferous and stanniferous drifts of the colony date from tertiary times.

Auriferous gravels are seen north of Cania Goldfield, on the lofty watershed between the Burnett and Dawson, capped by isolated basaltic table-lands; these drifts I suspect to be of tertiary age. Mr. Norman Taylor classes the auriferous drifts of the Palmer as tertiary. On the Cape River Mr. R. Daintree divides the auriferous drifts into "alluvial" (Recent) and "Pliocene,"* on what evidence he does not say. Mr. Aplint† describes "made hills" of pebbly quartz drift of "older date than the existing valleys" of the Gympie district. The identification of gravels in Queensland with the drifts of Victoria, from mere resemblance, seems to me to be rash.

The quantity of stream tin obtained from the Stanthorpe district has been enormous. The stanniferous drifts are doubtless of the same age as those on the New South Wales side of the border, which are described by Mr. T. W. Edgeworth David,‡ as older Tertiary.

A large area is covered by flows of basaltic lava, probably of tertiary age, to be afterwards described.

About 22 miles south-south-west of Rockhampton, near the head of the Dee Creek, a tributary of the Dawson River, is the now famous Mount Morgan gold-mine. I visited this mine in October, 1884, and the following description is taken from the Official Report. Brisbane: By Authority, 1884.

In the immediate neighbourhood of Mount Morgan, the "country rock" consists mainly of blueish-grey quartzite—a fine-grained siliceous sandstone, now more or less vitrified—full of minute crystals of iron pyrites and specks of magnetic iron ore, greywackes of the ordinary type; hard fine-grained sandstones of mingled siliceous and felspathic materials, now somewhat indurated; and, lastly, occasional masses of shale, hardened to a flinty consistency, and a few belts of serpentine. As the stratified rocks in this particular locality appear to have been in thick beds, and as their metamorphism has gone a considerable length, it is not easy to be certain of either dip or strike. The stratified rocks are, moreover, interrupted and intersected in every direction by dykes and other intrusive masses of dolerite (itself altered by the substitution of viridite for its augite or olivine), rhyolite, and other igneous rocks, the intrusive masses apparently occupying as much space as the remnant of the original stratified formation itself.

* Report on the Cape River Diggings, etc. Brisbane: By Authority, 1868.

† Report on the Gympie Goldfield, Brisbane: By Authority, 1868.

‡ Progress Report, in Report of the Department of Mines, New South Wales, for 1884, p. 153.

This country rock is traversed by reefs of the ordinary description, as, for instance, the Golden Spur Reefs, the Crow's Nest reef, and the mundic reef, all of which contain a pretty fair amount of gold.

Mount Morgan itself contains gold in a very unusual—I believe, a quite unprecedented—formation.

Aneroid measurements give the altitude of Razorback as 900 feet; of Hall and Company's offices, near No. 1 machine, as 705 feet; and of Mount Morgan, as 1,225 feet above the sea level. The mine is at the summit of the mountain.

The work (apart from prospecting or exploring operations) is carried on in two quarries or faces. No. 1 cuts into the hill from a level of about 25 feet below the summit, and is designed simply to remove the top of the mountain, for the purpose of passing it through the stampers. No. 2, or Magazine Quarry, presents the aspect of a "sidling" road, cut out of a steep hill, and attacks the auriferous deposit at a level of about 100 feet below No. 1.

The central portion of the upper cutting is a large mass of brown hæmatite ironstone, generally in great blocks (up to some tons in weight) with a stalactitic structure, as if the iron oxide had gradually filled up cavities left in the original deposit. The ironstone contains gold of extraordinary fineness, which, however, after a little practice, can be detected in almost every fresh fracture. The ironstone is more or less mixed with fine siliceous granules. Gradually, to the right and left of the central mass, the silica more and more replaces the ironstone. It is a frothy, spongy, or cellular sinter, sometimes so light from the entanglement of air in its pores that it floats in the water like pumice. Fine gold is disseminated throughout this siliceous deposit, as well as in the ironstone. Near the west end of the cutting is a vertical dyke of kaolin, mixed with fine siliceous granules, passing into pure kaolin, with some silicates of magnesia, including a fine variety of French chalk. I selected a number of specimens as characteristic of the various deposits of the upper cutting. These, when assayed by Mr. Karl Staiger, gave the following results:—

No. 5.—Stalactic brown hæmatite, from middle of cutting; 6oz. 11dwt. gold per ton.

No. 6.—Siliceous sinter, veined with quartz; 4oz. 5dwt. gold per ton.

No. 7.—A mixed mass of ironstone and silica from the level of the road, east of the dyke; 5oz. 3dwt. gold per ton.

No. 8.—Ironstained siliceous sinter, from the west side of dyke; 10oz. 14dwt. gold per ton.

The lower or magazine face presents a sort of fan-like arrangement of its various materials. In the centre is a band (almost vertical) of brown hæmatite in large "bombs," with a mammilated botryoidal or sometimes reniform appearance. To the right (east) is a nearly vertical deposit of aluminous iron ochre, followed by a mass (still nearly vertical) of red hæmatite in large cellular bombs. To the east is a broad mass of loose ironstained siliceous and aluminous material, which begins to lean eastward like the outer feathers of a fan. A great mass of loose earthy red hæmatite, another of brown hæmatite weathering to iron ochre, another of red earthy hæmatite, and another of brown hæmatite in large (ton) blocks, appear in succession as the cutting is followed to the east. The magazine (near the east-end of the cutting) is excavated in a fine white siliceous earth, and the cutting ends with a mass of soft earthy aluminate. Beginning from the west side of the nearly vertical mass of brown hæmatite first described, we pass in succession in going westward a band of yellow ochre, a broad belt of light siliceous sinter, ironstained, and containing some angular fragments of the quartzite of the "country rocks," a belt of similar siliceous sinter mixed with earthy red hæmatite, and finally a broad mass of loose siliceous sinter traversed by siliceous veins, and containing some angular fragments of the "country rock," the members of the series leaning more and more fan-fashion to the west as they recede from the central vertical bands. At the end of the cutting is a mass of magnesian and aluminous silicates, which is probably the prolongation of the dyke seen in the upper quarry. Mr. Lyle, the manager, informed me that he had got "prospects" in

every part of this cutting, with the exception of the siliceous earth at the magazine. This was corroborated by my own observations. I ground and washed a great number of specimens (of my own selection) from both the upper and lower cutting, and from every variety of material, and was surprised and delighted with the prospects obtained, in most cases from stuff which miners would regard as most unpromising.

Mr. Staiger's assays of characteristic samples selected from the lower cutting yielded gold as follows:—

No. 1.—Brown hæmatite, 3oz. 6dwt. per ton.

No. 2.—Red hæmatite, 6oz. 16dwt. per ton.

No. 3.—Aluminous rock from west of dyke, no gold.

No. 4.—Siliceous sinter from among the aluminous rock,
3oz. 15dwt. per ton.

Down the hillsides to the north, west, and south, a similar deposit is everywhere met with—a frothy or spongy matrix, sometimes aluminous, and sometimes siliceous, generally ironstained, and occasionally associated with large masses of red and brown hæmatite; but gold has as yet only been obtained from a few places away from the hill-top, although naturally there has been vigorous prospecting (so far as possible in an unusually dry season) wherever the “formation” resembled that of Mount Morgan. Perhaps the deposit on the slopes is more aluminous and less siliceous, and contains less of iron oxides than on the hill-top; but these are the chief differences, and the formation has evidently one origin throughout.

After a careful study of the whole formation, I have come to the conclusion that nothing but a Thermal Spring, in the open air, could have deposited the material under consideration. The frothy siliceous sinter agrees in every respect with the deposits of New Zealand and Iceland geysers, and of the still more wonderful hot springs of the Yellowstone National Park, so graphically and scientifically described by Dr. A. C. Peale. (“Twelfth Annual Report of the United States Geological and Geographical Survey of the Territories, Part II. Section 2,” “On the Thermal Springs of Yellowstone National Park,” Washington: 1883). The “frothy” and cavernous condition of the siliceous sinter of Mount Morgan, may be accounted for by the escape of steam, while the silica was yet (after its deposition on the evaporation of the water), in the gelatinous condition so frequently observed in the deposit of hot springs. The aluminous silicates represent the familiar outbursts, and flows of mud. The iron oxide appears to have been deposited in some cases along with the silica and alumina, and in others to have been deposited later—its solvent fluid having been, as it were, injected into the interstices, vesicles, and caverns of the silica and alumina. In some cases it may have been originally pyrites, as it now and then occurs in cubical hollows. Calcareous sinter is very common in siliceous springs, and its absence from Mount Morgan, must needs imply the local absence of limestones among the rocks from which the spring was fed. The silica would be found abundantly in the quartzites, and the alumina in the shales and greywacks of the country in the neighbourhood, and possibly both silica and alumina may have come in part from a deep-seated underlying granite. The gold, and to some extent the iron, may have been dissolved out of the iron pyrites of such reefs as the “Mundic Reef,” seen in Mundic Creek; the gold possibly by chlorine produced by the contact of hydrochloric acid, derived from the decomposition of chlorides, with manganese, which occurs sparingly in the form of pyrolusite along with the ironstone of Mount Morgan.

Several rhyolite dykes run from north-west to south-east, through the mountain.

That the deposit left by the thermal spring is newer than the altered stratified rocks through which it has burst is obvious; and that it is even newer than the much later date, when the rhyolite dykes filled up fissures in the stratified rocks, is proved by the fact that the dykes are clearly seen in some instances to be covered over by the siliceous, aluminous, and ferruginous deposits of the springs.

But yet another circumstance helps us in our endeavour to ascertain the age of the outburst of the Mount Morgan hot spring. About a mile to the west of the "mountain" is a mass—apparently about 150 feet in thickness—of horizontal bedded sandstone, undoubtedly the "desert sandstone." It rests apparently at this point on a mass of rhyolite, but in other places it may be seen lying on the upturned edges of quartzite and graywacke strata, similar in character to those of the "country" around Mount Morgan. The base of this formation is a fine volcanic dust. The upper beds are coarsely gritty, and for the most part siliceous, varying from white, to brown and red, and containing occasional pebbles of quartz and quartzite. The base of the desert sandstone I should judge to be about 100 feet lower than the summit of Mount Morgan.

Standing on the sandstone cliffs, so as to look to the east, past the south side of Mount Morgan, the observer can descry across the valley of the Dee the familiar contour of horizontal-bedded sandstone cliffs stretching North and South. As nearly as can be judged by the eye they are on the same level as the cliffs on the opposite side of the valley, and there can be no doubt that the valley has been carved out of a once continuous cake of horizontal sandstone. The question arises, "Was Mount Morgan an island in the sea, or lake in which the sandstones were laid down?" In that case the hot spring was older than the desert sandstone.

The answer is easily made. Had there been shores to this sea or lake where Mount Morgan now stands, the sandstone in the neighbourhood would have been full of pebbles of sinter and ironstone derived from the waste of such easily degraded rocks. But I saw none such, and I believe they do not occur. The hot spring then was newer, and not older, than the desert sandstone.

In many places in the north, the valleys carved out of the desert sandstone became theatres of volcanic activity. Among such places are the MacIvor River, north of Cooktown, and the Mulgrave River, near Cairns. There volcanoes burst out near the heads of the valleys and filled the lower reaches with flows of basaltic lava, to which we owe some of the richest agricultural land in the colony. Another form of volcanic activity was developed at the same period near the head of the Dee Valley. After the desert sandstone had been uplifted, and the carving out of the present valleys had been carried on for long ages—in fact till the valleys had nearly acquired their present contours, basaltic lava flowed down the valleys over the upturned slates of the MacIvor and over the auriferous drifts of the Mulgrave, and a geyser of enormous proportions spouted fitfully in the valley of the Dee, carrying with it not only water, but in all probability chloride of gold.

The Mount Morgan geyser as well as the MacIvor and Mulgrave volcanoes, probably date from tertiary times, and are contemporaneous with many of the basalts which cover auriferous drifts in Victoria.

In the presence of so much ironstone a precipitant for the gold need not be far to seek. Protoxide of iron was probably present in sufficient quantities to perform this important function, but it may have been aided by tannic acid derived from vegetable matter accumulated in the basin. Several instances of the occurrence of vegetable matter in the basins of hot springs in the Yellow-stone regions are recorded in the Report already quoted. Precipitation of the gold by means of tannic acid would accord better with the confinement of the gold to the basin or crater of Mount Morgan (to be afterwards alluded to), than precipitation by ferrous oxide.

The siliceous sinter, alumina, and ironstone of the overflow deposit merge into one another by insensible gradations. The outer boundary of the overflow deposit is, in some places ill defined, as the "country rock" is frequently impregnated with aluminous, siliceous, and ferruginous material, so as to be distinguishable with difficulty from the unmixed deposit. That the deposit does not extend far to the east of Mount Morgan, is owing simply to denudation, the deposit having been removed from the steep slope of the hill on that side.

In such active geysers as are accessible to observation, we find a narrow pipe or fissure, terminating upwards in a crater-like cup or basin. The Great

Iceland Geyser, for example, has a pipe 12 feet in diameter, which has been sounded to a depth of 70 feet. I have seen no satisfactory explanation of the necessity for a cup, nor can I suggest one; but, all the same, the repeated occurrence of the cup evidently takes place in obedience to some natural law. It may be taken for granted that the Mount Morgan geyser was no exception to the rule, and I believe that that upper portion of the mount, where ironstone predominates, and to which gold is almost confined, represents a basin, occasionally filled with a fluid in which silica, iron, alumina, manganese, and gold, were held in solution, to be deposited when the bulk of the water from time to time withdrew into the pipe or the subterranean reservoirs with which the pipe communicated. The overflow of the ejected fluid left a siliceous, aluminous, and ferruginous deposit on the slopes of the hill side, but the gold does not appear to have been deposited to any extent beyond the limits of the basin. It may be remarked that "prospects" of gold have been obtained in a few localities in the overflow deposit. In such cases it may be a question whether the gold was carried down with the overflow, or whether it emanated from some of the subsidiary springs, which, in such cases, as our experience of active geysers has shown, are pretty sure to break out in the vicinity of the main outflow.

Dr. Leibius, of the Sydney Mint, has contributed a paper on Mount Morgan, to the Royal Society of New South Wales (2nd July, 1884). I cannot do better than quote some of his observations:—

"While, from a geological point of view, the occurrence of this gold is highly interesting, the character of the gold obtained is not less so. Lock, in his work on gold, published in 1882, says, 'No gold has yet been found in nature unalloyed with silver.' Yet this gold from the Mount Morgan mine, of which, since February last, already over 10,000 ounces have been received, as retorted gold, at the Sydney Mint, is found to be free from silver—a minute trace excepted. I have brought some of this retorted gold out very thin, to show its toughness. It assays 99·7 per cent. of gold; the rest is copper, with a trace of iron. Gold assaying 99·7 per cent. is worth £4 4s. 8d. per ounce. Gold from the same mine, received at the Mint, assayed as high as 99·8 per cent. It is as far as I know the richest native gold hitherto found. . . . A not less interesting, though less satisfactory, fact is this—that only about half the gold is extracted by the ordinary quartz-crushing and amalgamating machinery." Dr. Leibius continues:—"The *Capricornian* says—'The tailings which are being stored are said to contain as much gold as is saved, and as they will be subjected to treatment at a future date, the result will be highly advantageous to the owners.' Having the small quartz-crushing machinery erected at the Sydney Mint under my charge, I have had an opportunity of testing this fact. In November last we received, through Mr. Hall of Sydney, 458 lbs. of this ferruginous quartz, part of it consisting of picked stone. It was carefully crushed and amalgamated in the Chilian mill, with 240 lbs. of mercury; thus, 7·44 ounces of gold, assaying 991·5, were extracted. Another lot, weighing 174 lbs., was similarly treated, and 12·12 ounces of gold extracted—assaying 998·2. Thus, lot 1 gave gold at the rate of 39·32 ounces, standard, per ton of quartz, while lot 2 gave gold at the rate of 169·86, standard, per ton of quartz. In lot 1, gold at the rate of 46 ozs. 2 dwts. 12 grs. per ton was left in the tailings; while in lot 2, the tailings assayed 64 ozs. 5 dwts. 18 grs. of gold per ton. Both lots of tailings were now mixed, and passed for 2 hours in the Chilian mill, with 240 lbs. clean retorted mercury. Only 1·66 oz. of gold, assaying 981, were, however, obtained by this treatment. The tailings were dried, and found to weigh 476 lbs., containing gold at the rate of 41 ozs. 13 dwts. 16 grs. per ton; or, in about 476 lbs. tailings, no less than 8 ozs. 17 dwts. 3 grs. gold. I have brought some of those tailings here. Under the microscope there is no gold visible. I thought that if the oxide of iron were removed by boiling the tailings in hydrochloric acid, and the solution filtered off, the gold might more readily be discernable in the boiled-out residue. I found, however, that this was not the case, and that 1,000 grs. of tailings thus boiled in strong hydro-

chloric acid, by which about 20 per cent. was dissolved, gave me only 0·73 grs. of pure gold, while 1,000 grains of the original tailings, not boiled out, gave 1·306 grs. of gold, the same as when boiled within nitric acid. The loss of gold by boiling in hydrochloric acid was, no doubt, due to the action of this acid upon manganese in the ore, whereby chlorine gas was formed—a ready solvent for gold. That the ordinary amalgamating Chilian mill did not extract all the gold in the stone, I can only attribute to the supposition that the oxide of iron has literally coated some of the fine gold, thus preventing it coming in contact with the mercury.”

CHAPTER XI.

POST TERTIARY.

THE late Mr. R. Daintree, in his paper on the Geology of Queensland (p. 274) says:—

“From the Gulf of Carpentaria, in the North, to Darling Downs, in the South, the fossil remains of extinct mammalia have been found in breccias and indurated muds, which are representatives of the beds of old water-courses, through which the present creeks cut their channels. At Maryvale Creek, in lat. 19° 30', good sections of these old brecciated alluvia occur. The fossils from this section, as determined by Professor Owen, are:—

Diprotodon australis.

Macropus titan.

Thylacoleo.

Phascalomys.

Nototherium.

Crocodile teeth, etc.

“Imbedded in the same matrix occur several genera of mollusca of species undistinguishable from those inhabiting the Maryvale Creek. My friend and late colleague, Mr. Robert Etheridge, junior, has compared these with the recent forms, and finds them to consist of—

GASTEROPODA.

Melania pagoda.

M. arca.

M. subimbricata.

M. mæsta.

M. sp.

Limnæa rimosa.

Phylhsa truncata.

P. sp.

LAMELLIBRANCHIATA.

Corbicula australis.

Unio, sp.

"The fact of these older alluvia forming both the bed and banks of the present water-courses goes to prove that *Diprotodon* and its allies inhabited the Queensland valleys when they presented little difference in physical aspect or elevation from that of the present time. The crocodile (*Crocodylus australis*), however, had then a greater range inland than it has now. A study of these *Diprotodon*-breccias leads to the conclusion that the remains were chiefly entombed in what were the most permanent waterholes in seasons of excessive drought, and that the animals came there in a weak and exhausted state to drink and die, just as bullocks do under similar conditions at the present time. No human bones, flint-flakes, or any kind of native weapon, have yet been discovered with the extinct mammalia of Queensland."

In his Report on the Geological Features of the South-eastern District of Queensland,* Mr. Gregory gives the following description of the "Older Alluvial or Fossil Drift":—

"The deposit is restricted to the valleys descending westerly from the main range dividing the waters flowing to the east coast from those which flow westerly to the Darling and Murray rivers. Its limits are not well defined, but it forms the banks of the present water-courses, near the summit of the range, and extends down them to the level plains near the banks of the Condamine River, where it appears to attain a depth of more than 100 feet, as fragments of bones have been obtained at that depth in sinking wells.

"It may however, be observed that though the fossil drift is only found on the western waters in Southern Queensland, there are rich deposits in bone drift on eastern waters of Peak Downs in the central district.

"This alluvium is remarkably rich in fragments of bones of extinct animals, including *Diprotodon australis*, *Macropus Titan*, *Thylacoleo*, *Phascolomys*, *Nototherium* &c.

"The bones are associated with fragments of shells of *Unio* and other fresh-water mollusca similar to those now found in the present water courses, but more massive in structure. Basaltic pebbles, sand and mud, the stratification of which indicates intermittent currents flowing down the present valleys, such as now result from the annual rainfall, but of much greater volume.

"Although the greater part of the bones are broken into fragments, and show evidence of being drifted and water-worn, there are some which prove that many animals cannot have been deposited before decomposition in the localities where their remains are now found grouped together.

"The general condition under which the bones are found indicates, that what are now broad valleys and plains, were originally extensive marshes with watercourses flowing westward into lakes, and that the gradual filling up of the lake-beds with drift, and the deepening of the channel of the Condamine River which drains the country,

* Brisbane: By Authority, 1879.

conjoined probably with a gradual decrease in the annual rainfall, have combined to change a swampy country covered with coarse weedy vegetation into open downs and plains, producing short grasses totally inadequate for the support of animals with the heavy frames and peculiar teeth which characterised the majority of the ancient occupants of the district.

"There is no trace, either in the Darling Downs or any other part of Queensland, of any violent convulsion of nature which would be adequate to cause the total destruction of the *Diprotodon* and co-occupants of the country, and it seems most probable that their extinction resulted from a gradual change of climate, and more effectual drainage through the deepening of the channels of the water-courses—aided, perhaps, by some slight changes of level. Few satisfactory traces have been found of the vegetation of this period, though some fragments of what appear to have been woody seed-vessels are met with in the bone drift, but their condition is not sufficiently perfect to admit of any definite conclusions. The general character of the vegetation may however, be surmised from the form of the animals, the structure of their teeth, and the mode in which they are worn by feeding on it. These data suggest coarse reeds and aquatic plant, such as would be too succulent and liable to rapid decay for their preservation as fossils, while the absence of wood and ferns, which are so abundant in the older coal strata beneath, indicates that there was little or no forest.

"One remarkable feature of the older alluvium is, that the fossil bones are only found in the detritus of the basaltic rocks. Alluvium of the same age, derived from the carbonaceous and Devonian series, have not as yet been found to contain remains of the extinct animals. This may have resulted from the superior fertility of the basaltic lands, which would be capable of producing abundance of food, while the comparatively sterile soil derived from the older formations would not furnish suitable vegetation for the sustenance of the massive quadrupeds of that era."

Professor Sir Richard Owen, K.C.B., described ["Quarterly Journal Geological Society," London, volume 14, page 541] *Zygomaturus trilobus*, Macleay, from King's Creek, Darling Downs. A further description is given in vol. 15, page 168; and on page 176, Sir Richard announced the identity of species with *Nototherium Mitchelli*, Owen. A further description of the same species was given in vol. 38, page 394. Professor Huxley, in the "Quarterly Journal Geological Society," London, vol. 18, page 423, describes a new genus of *Diprotodon* under the name of *Diprotodon minor*, from Gowrie on the Darling Downs.

Sir Richard Owen's large work on the "Extinct Mammals of Australia" (1870), contains descriptions of a numerous fauna from the Darling Downs.

The Brisbane Museum contains remains of the following:—

Macropus titan, Owen (Darling Downs).

M. affinis, do. do.

M. tellus, De Vis (Darling Downs).

M. ajax, do. do.

M. gouldii, Owen do.

M. achilles, De Vis do.

M. subducens, do. do.

Ammonodon, n.g., do. do.

Protemnodon anak, Owen do.

P. antaeus do. do.

P. hector, De Vis do.

P. ulysses, do. do.

P. mimas, Owen do.

P. trilobus, De Vis do.

P. hercules, do. do.

P. nanus, do. do.

Rhysodon aeneas, do. do.

Apsilodon cæsar, do. do.

Sthenurus Atlas, Owen do.

S. brehus, do. do.

S. pan, do. do.

Pachysiagon ferragus, do. do.

Halmaturus latidens, De Vis do.

H. prior, do. do.

H. nuncius, do. do.

H. lapsus, do. do.

Petrogale exoleta, do. do.

Palorchestes azael, Owen do.

P. baal, De Vis, do.

Procoptodon goliath, Owen do.

P. magog, De Vis do.

P. sampson, do. do.

P. rapha, Owen do.

P. pusio, do. do.

Brachalletes palmeri, Owen (Chinchilla).

Sthenomerus, De Vis

Nototherium victoriæ, Owen.

Diprotodon australis, do. (Pilton and Kings Creek, Darling Downs).

Dinornis queenslandiæ, De Vis (King's Creek).

The occurrence of *Diprotodon* in the gold drift of Gogango Creek, near Rockhampton, is noted by Mr. Daintree in his "General Report upon the Northern District" (Brisbane: by Authority, 1870).

A portion of a lower jaw of a species of *Diprotodon*, pronounced by Mr. R. P. Ramsay, Curator of the Australian Museum, Sydney, to be probably the young of *D. Australis*, or perhaps a new species, was found by Mr. T. Buckland on the bank of the Burdekin, opposite Gilgunyah Head Station.

CHAPTER XII.

SERPENTINE.

AN extensive belt of Serpentine is described by Mr. Daintree* as extending at intervals from Mount Wheeler to Marlborough. Mr. Daintree observes:—

“Hitherto, in older mining countries, serpentine has not been considered an ore-bearing rock to any extent. Here however, not only do paying quartz reefs lie in it, but at Block’s claim under the mountain, and at old Canoona, it is proved that gold exists in the rock mass itself; and I have no hesitation in asserting that the whole of the gold taken from the last named diggings has been derived from this source.

“Chromic iron and chrome ochre are distributed over this serpentine country, and with a small proportion of titaniferous iron form the black sand so troublesome to the digger.

“Very numerous outcrops of copper ore have been discovered in this district, which may be divided into three classes.

“1st. Those derived from the decomposition of thin pyritous veins, carrying a small amount of copper, which by decomposition and re-precipitation, have formed surface layers of rich ore, and have impregnated the joints and cavities of the bounding rock to varying depths with earthy blue and green carbonate.

“This class of vein is however generally represented on the surface, by a hard iron band, stained and coated with copper ore but, is more worth prospecting for gold than copper.

“2nd. Where the rock itself is pyritous and the pyrites decomposing, stains the joints and cavities with copper ore sometimes for a considerable distance from the source of the ore itself.

“3rd. Deposits of true copper ore, in a matrix of quartz calcspar, &c., with at least one defined wall, promising to become in depth true lode.”

After describing the Mount Wheeler reefs, Mr. Daintree remarks that the ridges around the mountain are “composed of ‘Serpentine,’ passing into diallage rock and gabbro,” Schiller-spar being also not an uncommon constituent.

In a subsequent report† the same writer refers to the serpentine of the Cawarral district as “evidently an intrusive rock, and not an altered sediment.”

The occurrence of serpentine with copper infiltrations at Sandy Creek, a tributary of Barambah Creek is noted by Mr. Aplin in his report on the Burnett District. (Brisbane: By Authority, 1870).

* “Progress Report on a portion of the Rockhampton Mining District.” Brisbane: By Authority, 1870.

† “General Report upon the Northern District.” Brisbane: By Authority, 1870.

Mr. Gregory notes* the occurrence of copper lodes in Serpentine at Mount Coora Auriferous Reefs, in Serpentine Country in the Kilkivan district are mentioned in the same report.

CHAPTER XIII.

GRANITE, SYENITE, AND PORPHYRY.

IN giving a single colour to these rocks, on the ground of their lithological relationship, the highest purpose of a geological map is not served. In some regions Granites and Syenites are clearly metamorphic. In others, whether originally of metamorphic or of plutonic origin, they are covered by the oldest fossiliferous deposits of the colony. Sometimes they are intruded among the earlier rocks. One boss of granite on the Norman River appears to have been intruded among rocks so recent as the Desert Sandstone. Sheets of quartz-porphry in the neighbourhood of Townsville have been intruded among rocks containing *Glossopteris*, and presumably of the age of the Bowen River Coalfield. Mr. Gregory refers† to “the extensive development of the porphyritic rocks which, rising through the Carbonaceous strata [Ipswich beds], form the range dividing the valley of the Mary River from the Maroochy River, and extending in a southerly direction, exhibit those remarkable outbursts known as the Glasshouse Mountains.”

The same author thus refers to the porphyries of the Moreton and Darling Downs districts‡:—“The porphyry consists of a pale-brown paste with minute felspathic crystals, though it sometimes varies so as to consist of very small grains of quartz with minute cavities, containing oxide of iron, resulting from the decomposition of pyrites. Occasionally it is vesicular, and has the aspect of trachyte.

“The age of this rock is greater than that of the basalts, which cut through and overlay it, though it often occurs that the basalt has found vent through the same fissures as the porphyry, and formed spurs to the more elevated masses of the older igneous rock, a feature which is especially developed on both sides of the Main Range, near

*Report on the Geology of part of the Districts of Wide Bay and Burnett, Brisbane: By Authority, 1875.

† Report on the Geology of part of the District of Wide Bay and Burnett, Brisbane: By Authority, 1875.

‡ Report on the Geological Features of the South-eastern Districts of Queensland. Brisbane: By Authority, 1879.

Cunningham's Gap, where Mount Cordeaux, Mount Mitchell, and Spicer's Peak are porphyry, and the subordinate ranges basaltic.

"On the other hand the age is less than that of the Carbonaceous Series [Ipswich beds], as the porphyry in all cases is found superimposed on the sedimentary strata.

"The porphyritic rock is chiefly developed in the southern portion of the Moreton district, where it forms all the remarkable peaks on the Great Dividing Range from the head of Laidley Creek to the southern boundary of the colony, and thence along the Macpherson Range, which separates the Logan River from the Clarence, Richmond, and Tweed rivers.

"The general aspect of these hills is a succession of sharp peaks, formed by the upheaval of portions of strata, with a change of angle, one side of each hill being a nearly even slope, with a steep escarpment on the opposite side. The steep side, however, shows a columnar structure, which is vertical, and not a right angle, with the slope on the opposite side of the hills. Some of these peaks, as Mount Barney, Wilson's Peak, Mount Lindsay, and Mount Mitchell, have an altitude of 3000 and 4000 feet, and show the porphyry to exceed 2000 feet, but in every case resting on carbonaceous rocks [Ipswich beds]. Though the porphyry sometimes flowed over considerable areas in thin sheets, and shows a cellular structure, yet the greater part must have been less fluid when erupted than the basalts.

"Besides the principal mass between Cunningham's Gap and Mount Lindsay, there are several detached points of eruption, as Knapp's Peak, Mount French, Mount Edwards, Flinders Peak, and Mount Goolman, all situate to the South of Ipswich; Mount Esk, on the Upper Brisbane River; Kangaroo Point, Bowen Terrace, and Spring Hill, in the town of Brisbane; also the Glasshouse Mountains.

"In the town of Brisbane the porphyry is erupted through the Devonian slate, fragments of which are disseminated through the porphyry, while portions of silicified wood are embedded in the lower surface of the erupted mass."

I may observe that I am inclined to regard the Kangaroo Point and Bowen Terrace rock as an altered brecciform volcanic ash, rather than as a crystalline rock.

CHARTERS TOWERS GOLDFIELD.

In my Report "On the Geology and Mineral Resources of the District between Charters Towers and the Coast," (Brisbane: By Authority, 1879), are the following passages:—

"The Granites, Syenites, and Porphyries represent the highest degree of metamorphism observed in the district. They form the main mass of the coast range, and indeed of the high grounds generally. To the Granites belong Magnetic Island, the part of the coast range between Mount Frederick and Mount Black, together with the greater part of the gently undulating table-land from Thornton's Gap to Dotswood, the back of the range drained by the heads of the Ross,

Reid, and Houghton, much of the comparatively low-lying country at Charters Towers and Millchester, some of the pinnacles to the west of Towers Hill, the rolling downs between Towers Hill and the Pyramids or Seventy Mile Range, and some isolated masses in the Star district.

"The Charters Towers Granite has a matrix of cream-coloured felspar, in which are disseminated crystals of orthoclase felspar, quartz, mica (biotite), and hornblende; also chlorite, iron pyrites, and some (microscopic) garnets. Charters Towers Hill best deserves the name Syenite. The main masses of porphyry are Mount Stewart, Castle Hill, Mount Louisa, Mount Bohle, the Range at the head of Running Creek (Star Country), and the Pyramids or Seventy Mile Range.

"Although presenting no very essential lithological difference, the granites and syenites on the one hand, and the porphyries on the other, yield to the influences of sub-aërial denudation in different manners, and give rise to characteristic types of scenery. The porphyry ranges are hard-featured and abound in bold escarpments and precipices. The rock is full of joints, which divide it into sharp angular pieces. The granites and syenites on the other hand have a more regular system of jointing, dividing the rocks, for the most part into huge cubes and parallelopipedons. When in the course of denudation these are brought to the surface, they peel off in rudely concentric layers, the angles are softened, and the masses assume at length a somewhat globular form. The country occupied by granite and syenite is characterised by rolling downs, with abrupt towers or peaks, like the 'tors' of the Forest of Dartmoor. In spite of these distinguishing characteristics, which are noticeable on the large scale, no very sharp line can be drawn on lithological grounds between the granites and porphyries, as they merge into one another.

It appears most probable that the granites and porphyries were produced during one continuous period, the porphyries predominating towards its close, as porphyry dykes not only intersect the granite, but also the auriferous veins in granite country, and are even found cutting through the Devonian (?) rocks of the Star basin."

As has already been remarked, the granite and syenites of Charters Towers, appear to represent the last stage of the metamorphism of certain stratified rock which occur to the north and west of the gold-field.

It is a circumstance worthy of remark that the richest auriferous reefs occur in the most highly metamorphosed rocks, near their contact with the least metamorphosed rocks of the district.

Charters Towers bids fair to produce shortly the largest output of any gold-field in Australia. It reached in 1885, 134,650 ounces, which may be estimated at about one forty-seventh part of the production of the whole world. The reefs have no uniform bearing, but appear to take as a whole, a sort of arrangement in the form of a horse-shoe, of which the reefs forming the western limb bear from

N.N.W. to S.S.E., and those forming the eastern limb from N.N.E. to S.S.W. All of these underlie at low angles eastward, northward or westward towards the axial line of the horse-shoe. Some of the most important reefs are cross-courses, such as the Day Dawn and Queen. Down to a variable level, generally less than 100ft., the gold was "free" in a *gangue* of granitic debris and quartz mixed with "brown-stone" or decomposed pyrites. Below that level, the gold occurs in quartz with a "mundic" composed of pyrites, galena and zinc blende.

The Day Dawn Company has paid £155,000 in dividends. The deepest shaft on the field is the "Hope"—300ft. vertical and 502 on the underlie. The Day Dawn Prospecting Company, has a shaft 704ft. on the underlie. The Day Dawn Block has sunk 480ft. vertically.

The progress of the Charters Towers field since its discovery, in 1872, is shown by the returns given in the Annual Report of the Department of Mines.

					ounces.
Year 1872 (a few months only)					20,064
1873	...	...	...	...	59,835
1874	...	.	...	...	52,872
1875	...	...	...	...	62,214
1876	...	...	...	...	58,068
1877	...	...	...	...	66,479
1878	...	...	...	...	72,189
1879	...	...	...	...	83,275
1880	...	...	...	...	85,298
1881	...	...	...	...	82,324
1882	...	...	...	...	79,595
1883	...	...	...	...	69,555
1884	...	...	...	...	109,335
1885	...	...	...	...	134,650

RAVENSWOOD GOLDFIELD AND SILVER MINES.

At and around the Township of Ravenswood, the country rock is a grey syenitic granite in which hornblende accompanies or takes the place of mica. Sometimes the amphibole takes the form of actinolite instead of hornblende. A tolerably sharp line divides this granite from masses (One Mile Hill, &c.) of red coarse-grained granite,—a mixture of large flesh-coloured or pink orthoclase felspar crystals, roundish globules of quartz, and hexagonal mica. The best reefs lie within the area of the grey syenitic granite. There are distinctly two systems, the one running north and south, and underlying to the east, and the other running east and west, and underlying to the south. The north and south system comprises the Shillmaleer, Mellnauer, London, General Grant, and most of the most prominent reefs of the field. Most of the reefs have a quartzose gangue, and contain iron and copper pyrites, zinc-blende, galena, and other

minerals, in addition to gold. This complicated "mundic," when exposed to alternate atmospheric and aqueous influences, is decomposed, the metallic compounds being oxidised and the gold set free; consequently the field was a favorite "poor man's diggings" till the water level was reached. At that level, however, most of the mines suffered a severe check, as it was found impossible to save more than a small proportion of the gold with the appliances then on the field. The products of some of the richer mines, such as the General Grant and Black Jack (one of the east and west reefs), were for a time sent to Europe for treatment; but many of the others which had paid well in the "brownstone" did not produce a sufficient quantity of rich ore to yield a profit after paying expenses, of which the heaviest item was the carriage to the coast. The opening of the Ravenswood railway has however cheapened the cost of carriage considerably, and local smelting works have been erected, capable of extracting the gold from the pyrites. A new era has dawned upon Ravenswood, which will in future compete with the foremost gold-fields in the colony.

A large lode of argentiferous galena has been worked for some years at the One Mile, and has proved very rich.

The lode has recently been cut in a vertical shaft, at the depth of 650 ft. The Warden, Mr. John Archibald, says, in his Report for November last, that at this depth the gangue is 5 feet wide. The ore is exceedingly rich, "Assays giving by ordinary fire process from 500 oz. to 5,000 oz. of silver per ton. The rich ore is contained in a vein from 6 inches to 12 inches thick near the hanging wall, and, singular to say, contains the merest trace of lead. The formation (gangue) below this ore is intersected by small galena veins. . . . About 6 tons of this rich vein have already been raised. . . . Mr. Merry, a gentleman connected with the Ravenswood Gold Smelting Company, and formerly with Messrs. Vivian & Company, of Swansea, by profession a practical analyst, has, at my request, very kindly placed at my disposal an exhaustive analysis made by him of this valuable find:—

"Copper	...	...	...	16.25
Antimony	...	...	...	26.30
Silver	...	...	...	15.35=5,013 ounces.
Iron	...	...	...	8.49
Zinc	...	...	...	8.75
Sulphur	...	...	...	17.02
Siliceous matter	...	...	...	7.31
				99.47 per cent."

Several silver (argentiferous galena) lodes and some antimony lodes occur between the One Mile and Mount Wright.

The Gold produced at Ravenswood, according to the Returns of the Department of Mines, has been as follows:—

To end of Year.	Ounces.
1877	201,400
1878	13,252
1879	15,744
1880	13,445
1881	10,195
1882	8,711
1883	13,000
1884	14,192

The amount of silver and lead ore raised in 1884, from Ravenswood and the Star, was 4,186 tons, valued at £33,727.

ETHERIDGE GOLDFIELD.

The Etheridge Goldfield lies mainly in granite country. It is, unfortunately, situated at a distance from the coast. The general opinion among experienced miners is, that when connected with the coast by railway, it will prove one of the richest fields in the colony.

The Returns from the Etheridge and Woolgar are mixed up in the Reports of the Department of Mines. They are as follows:—

To end of year.	Ounces.
1877	143,000.
1878	7,396.
1879	15,498.
1880	20,368.
1881	23,020.
1882	18,431.
1883	18,967.
1884	19,886.

MARENGO GOLDFIELD.

In this region, a low table-land, a spur of the Clarke Range, projecting to the north, divides the head waters of the Bogie from the valley of the Dee. The lithological description of this limited area may be applied to the whole of the range between the Burdekin and the coast—essentially a white granite, in which the mica is sometimes supplemented and occasionally replaced by hornblende; frequent bosses of intrusive pale pinkish felspar-porphyrries and occasional small areas of gneiss and mica-schist, and of unmetamorphosed, or at least still recognisable shales and greywackes. The Black-and-White Hill and the One Mile Mountain are of typical granite. “The Brothers” are composed of a very tough dark-blue syenite, weathering black. Mount Marengo affords an example of the intrusive felspar-porphyry.

The field was opened in 1871. The reefs were worked down to the water-level, and abandoned.

BLACK SNAKE GOLDFIELD.

This field is described as follows by Mr. A. C. Gregory, in his “Report on the Geology of Part of the Districts of Wide Bay and Burnett”:—

"The Black Snake and other adjacent goldfields are on thin veins of quartz, which traverse the granite, and contain iron and copper pyrites, with a little gold and silver. The quartz and pyrites being much decomposed near the surface when the reefs were first opened, there was a considerable quantity of free gold easily extracted by crushing and washing; but, in sinking, the rock was not only harder, but the pyrites interfered with the crushing, by cutting the gold with its sharp angles, and at the same time it acted chemically on the mercury in the battery, forming a crust, over which the smaller fragments of gold passed, and the production of the precious metal did not pay the expense of working. Subsequently attempts were made to extract the gold, silver, and copper from the pyrites, by collecting it below the crushing machine, and smelting it in furnaces, which were erected on the spot at great expense; but the results do not appear to have been satisfactory, as the works are no longer in operation."

Samples of the Black Snake stone, which I have seen, have a good deal of zinc-blend, and altogether bear a considerable resemblance to the Ravenswood ores. They are said to assay very well, and the experiment of smelting will probably be renewed.

MILTON (NORTON) GOLDFIELD.

This goldfield is minutely described in his "Report on the Goldfields of Raglan, Calliope, and Milton," (Brisbane: By Authority, 1885), by Mr. Rands, who gives a geological map, on which the various reefs are laid down.

"The formation is a grey medium-grained granite, consisting of orthoclase felspar, quartz, biotite mica, and hornblende, which passes in places into a syenite, and in others into porphyry.

"The granite is in the form of an eruptive 'boss,' which rises through, and sends out veins into the surrounding slate country.

"On ascending the highest peak of the Bald Hills to about 300 feet from its summit, there is a layer of intrusive granite about 30 feet thick, dipping, in all probability, with the formation, at a high angle to the north-west, having intruded along the planes of bedding.

"The granite is intersected by gold-bearing reefs and volcanic dykes of diorite, porphyry, and dolerite. These dykes are of more recent date than the reefs, as they cut through the reefs; but there is no evidence to show to what period they belong."

The gold is contained in a fine "mundic," consisting of iron and arsenical pyrites, zinc-blende, and galena in a gangue, in which quartz and occasionally calcite are mixed up.

The total returns from Milton Goldfield for 1884 were 7883 ounces of gold, from 2766 tons of stone.

CROCODILE GOLDFIELD.

This goldfield, with the exception of a few reefs is in syenite country. Among its most important reefs are the Hector, Who'd-have-thought-it, Block and Pillar, Hit or Miss, Union, and Windsor. The

reefs yielded well in the "brownstone," and the workings are now being carried into the "mundic." The gold occurs in very white pyrites. The field, after a period of depression, is rising into importance. The deepest shaft is 150 feet. The Mount Morgan deposit is in the Crocodile Extended Goldfield, but is treated under the head "Tertiary."

HERBERTON TIN MINES.

The Herbert Tin Mines were only discovered in 1880. They occur in a rock which, although difficult to describe (owing to its variability) is easily distinguished from the true granite of the Walsh. It is a porphyry or granite, in which granular quartz predominates. There is little felspar, and very little mica. This "country rock" is traversed by a number of large "elvan" dykes—compact, highly silicated yellow or pinkish felspar, with blebs of quartz. The elvan sometimes passes into quartzite, and is sometimes veined with quartz. The quartz has in places rather large quantities of arsenical iron pyrites. Cavities in the elvan dykes are occasionally coated with blue carbonate of copper. The "elvan" dykes are not on this field, as they are in Cornwall, prolific sources of tin ore; indeed the "Three Star" and "Herberton Ironclad" elvans are almost the only known cases of stanniferous elvans, although in some cases (*e.g.*, Erin-go-Bragh and Southern Cross) the elvans appear to have re-opened the stanniferous dykes, and permitted of a further local deposition of tin ore.

The main deposits of the tin ore are in a series of metamorphosed igneous dykes. These dykes consist mainly of quartzose chlorite and quartzose serpentine. They were probably at first intruded among porphyry rocks as quartz diorites, or as rocks more or less of basaltic type. The tin ore occurs in floors, veins or pipes among the joint-planes of the dykes. The dykes have no ruling direction.

The ore (binoxide of tin) is very rarely crystalline, but occurs either as large amorphous masses almost chemically pure, or intermixed with the dyke rock. Sometimes, as in the Bradlaugh claim, the ore is so finely disseminated through the dark chlorite matrix as not to be visible to the naked eye, although the specific gravity of the stone serves as a guide to its metallic contents. Fluor spar and wolfram are associated with the tin ore in a few of the mines. In some cases the dykes appear to be replaced in parts by reef quartz, among the interlacing crystals of which the ore is imbedded. The matrix of the ore at the Wheal Vohr, is massive penninite or hydrous talc. In this case copper pyrites occur along with the tin ore.

In my "Report on the Tin Mines of Herberton, Western and Thompson's Creek districts," (Brisbane: By Authority, 1883), full descriptions are given of the Great Northern, Erin-go-Bragh, Cottais', Southern Cross, Dawn of Hope, Irish National Land League, Saggaoth, Defiance, No. 1 East Great Northern, General Grant, Nelly Grant, Ly-ee-Moon, Home Rule, Herberton Ironclad, St. Patrick No. 1, St. Patrick, St. Patrick Block, Young American, Chance, Foy's Chlorite, New Zealand, New Zealand West, Lottery, Irish Girl,

North Star, Welcome, Cornstalk, Nova Scotia, Great Eastern, Wild Irishman, No. 1 Wild Irishman, Syndicate, Hopeful, London, Alma, Glanmore, Star of the South, Brisbane United, Black King, Orient, Shamrock, Three Star, New Dalcoath, Monarch, Leviathan, Bradlaugh, Phoenix, Scotsman, Birthday, Levant, Wheal Vohr, Day Dawn, True Blue, Black Chief, Silver King, Clyde, New Chum, Surprise, Nancy Lee, Louisa, Poor Stroller, Big Ben, Maori Chief, Queen, Perseverance and St. Mungo Claims (Herberton); and Ulster, Come by Chance, Leinster, Glencairn, Pride of the West, St. Patricks' Day, Parnell, Herbertina, Try Again and Chance, Day Dawn, St. Kilda, Victoria, Argyle, King of the North, Excelsior and Watson's Folly, Anna Parnell, T. No. 1 East, Boulton's Folly, Dreadnought, Stewart's T., Queen of the West, Great Western, No. 1 West Great Western, Boundary, Caledonian, Mountaineer and King of the Ranges Claims, (Watsonville).

The above-named Watsonville lodes occur in a continuation of the Herberton porphyry range. On the northern slope of the range, is the belt of slate and greywacke country already described as containing lodes in which tin ores and copper ores are intimately associated. This belt of stratified rocks divides the stanniferous porphyry from a true granite in which no tin has yet been discovered.

At Thompson's Creek, the Tasmanian, Pompeii, Vesuvius, Chesterfield, Colossus, and Giblets mines occur, in dykes similar to those of Herberton and Watsonville. Tin lodes are also found on Emu Creek.

Stream and lode tin are also obtained from Pinnacle and Oakey Creeks. On the Tate River, and on the Dry River, Nettles or Annitt Creek, Return Creek and Rudd's Creek (all tributaries of the Herbert River), stream tin has been obtained in large quantities. At Kangaroo Hills, and the Star, stream tin has been obtained in porphyry country on tributaries of the Burdekin. At Return Creek and Kangaroo Hills, very promising lodes have been opened. Stream tin has been found underlying basaltic lavas in the neighbourhood of Herberton.

Carbonate of bismuth and copper ores have been discovered between Return Creek and Kangaroo Hills.

According to the reports of the Department of Mines, the Herberton District produced up to the end of 1883, 12,505 tons of lode tin, valued at £109,740, and 600 tons of stream tin, valued at £25,200. In 1884 the quantity raised was: lode tin 1902 tons valued at £68,474; and stream tin 450 tons valued at £16,200. The correctness of the return for 1883 has, however, been called in question.

At Baird's Camp, on the Bloomfield River, about 9 miles from the upper landing, and 13 miles from Bauer's Wharf, stream tin workings have recently been opened, and appear to promise well. The tin ore is probably derived from the granite country of Mount Peter Botte.

CANNIBAL CREEK TIN MINES.

At Cannibal Creek, South-east of Maytown, tin lodes have been recently opened. They occur in granite country. The yield of

alluvial tin from this district, in 1883, was 199 tons, valued at £10,119, and in 1884, 70 tons, valued at £3,556.

STANTHORPE TIN MINES.

The alluvial deposits of Stanthorpe district have, as has already been stated, yielded large quantities of tin ore.

The district consists—at least as far South as Ballandean—mainly of granite, composed of grey or pinkish orthoclase crystals, quartz in granules and mica (muscovite). The component minerals, especially the felspar, vary greatly in frequency of occurrence as well as in size. The region in question presents the usual features common to granite country. It forms a table land at an average elevation of a little less than 3,000 feet above the sea. The high grounds rise in soft undulations, where the granite is decomposed to a considerable depth, with an occasional isolated “tor” or mass of granite in huge blocks, undecomposed, but with their asperities rounded off. The summit of the range which divides Queensland from New South Wales presents a chain of such “tors,” often continuous for some distance, but with frequent gaps where the rock has been disintegrated. By such gaps the range may be crossed almost imperceptibly in many places.

The heads of the streams which drain this sort of country are shallow and swampy. Where the streams attain any magnitude they find it easy to wander among the soft decomposing surface of the lower granite country. The Severn, therefore, and its tributaries, such as Quatpot Creek, have exceedingly tortuous courses and deep alluvial deposits.

By far the greater part of the stream tin is in fine grains, of the size of a pin's head and under, and almost always reveals under the lens some trace of an original crystalline condition. It contains a large proportion of the “ruby” and “amber” varieties. Together with quartz granules it forms, as a general rule, the matrix of a coarse imperfectly cemented conglomerate or gravel of quartz and granite pebbles. The pebbles are often rather squared than rounded. They are not of a nature to retain striations well, but the shape of some of them leads me strongly to suspect that their attrition might, in the first instance, have been due to glacial action. The crystalline fragments of felspar, which have frequently been carried into the wash along with the quartz and tin-stone, have in most cases decomposed into a stiff Kaolin, which sometimes helps to keep the wash together.

The tin-wash is, for the most part, confined to the layer of gravel or unconsolidated conglomerate lying directly on the bed rock. This gravel is generally overlaid by a varying thickness (up to 25 feet or more) of gritty sand, which is occasionally interrupted by thin layers of gravel (with streaks of tin-stone) or of clay.

After an examination of the alluvial workings (in 1882) I concluded that the tin-stone, in its original matrix, must have been in the form of crystals, rarely of large size. The ore was probably *concentrated* by the weathering of its matrix—whether reef, lode, or dyke—and of

the encasing granite country, during a long period of gentle subaërial denudation, when the rains were never sufficiently heavy to remove the tin, or even the larger quartz stones, from the hillsides where they were left by the decay of their matrix. To this there apparently succeeded a limited period of heavy rainfall, or possibly of snow, whose melting produced a rush of water sufficiently strong to "sluice" the general surface of the hill country, and to deposit its heavier materials (including the tin-stone) in the upper reaches of the Severn and its tributaries, while carrying off its finer particles to the plains of the South West. To the now current period belong the accumulation under temperate conditions, of the existing surface-wash on the hill sides (moderately rich in tin ore), and the deposition of the sand (almost destitute of tin ore) which overlies the tin-wash in the streams.

Two distinct types of tin-bearing rocks are met with in the district—quartz reefs, and igneous dykes.

The reefs are best developed in the ridges on the left bank of Quartpot Creek, nearly opposite Sommerville's homestead. Here are the outcrops of at least seven reefs or veins, four of which bear north-north-east, one north-east, and one east and west. They are of highly crystalline quartz (sometimes smoky), and all contain much wolfram and moderate-sized crystals of tin, the latter almost always confined to faces and joints. Such reefs are apparently the sources of some of the coarser stream tin which is locally met with.

The dykes are composed of granular quartz, fine scaly lithia-mica, and small crystals of tin-stone, and form a rock much resembling the stanniferous Greisen of Saxony. They seem to have been erupted in a molten condition (bringing up the tin-oxide with them) among fissures in the granite. The tin-stone bears, in some samples I have seen, a proportion of 5 or 10 per cent. to the general mass of the rock. Dykes of this character are seen at various points in the range on the boundary of the colony, between the heads of Kettle Swamp and Sugarloaf Creeks. They run at varying angles from north-north-east to east-north-east, coinciding in their direction with a system of joining, which characterises the granite. The tin ore crystals of the dykes are precisely what, with a little attrition, would form the main mass of the stream tin of the heads of the Severn.

In spite of the riches of the alluvial deposits of Stanthorpe, no payable tin lode has yet been found on the Queensland side of the boarder.

The literature of the subject comprises the following papers:—

- "Report on the Queensland Tinfield," by W. C. Hume, 1874.
- "Report on the Mineral Discoveries on the Head of the Severn River and its tributaries," by A. C. Gregory (Brisbane: By Authority, 1872.)
- "Report on the Geological Features of the South-eastern Districts of Queensland," by A. C. Gregory (Brisbane: By Authority, 1879.)
- "Report on the Stanthorpe Tin Mining District," by W. H. Rands (In Annual Report of the Department of Mines for 1883).

MOUNT PERRY COPPER DISTRICT.

Mr. Gregory's Report on the Wide Bay and Burnett district contains descriptions of the Mount Perry copper lodes. The same mines are described by Mr. Rands in his Report on "The Goldfields of Raglan, Calliope, Milton (Norton), and Cania, and on the Mineral Deposits in the Burnett district" (Brisbane: By Authority, 1885), as follows:—

"THE MOUNT PERRY LODGE"

"Was the first copper lode discovered in the district. The outcrop at the surface can be traced by a very red gossan, for a distance of three-quarters of a mile, a point close to the Mount Perry Railway Station. It first crosses a low ridge, then across a small gully, and on across the high ridge which forms the watershed of Sandy Creek. The white granite of which this ridge is composed, is jointed in a north-westerly direction, and contains large crystals of black mica and some hornblende. Large boulders of it stand out all over the hill.

"Seven shafts have been put down on this lode, of various depths; the main or engine shaft is now between 800 and 900 feet deep. The course of the lode is north, 37 deg. east; and where it is at present being worked (to the south-west of the main shaft) hades to the south-east about 8 degrees.

"Near the surface the ore consists of green carbonate and azurite, and at thirty feet deep of rich red (suprite) and grey oxides of copper, and below this, depth of yellow ore and copper pyrites. The pyrites is contained in a veinstone of quartz and calcite, each of which predominates in turns. To the north of the main shaft much iron pyrites has been met with, mixed with the copper ore.

"At the present depth, the lode is about four feet in width. The width of ore is about ten inches on an average, with a casing consisting of a mullock of broken granite on either side.

"The lode is intersected by several cross-courses, and is faulted by some of them.

"The main shaft is sunk on the chief of these cross-courses, which runs in a west, 15 degrees north, direction, and underlies 12 degrees to the south, displacing the lode thirteen fathoms to the east on its north side. This cross-course is composed of granite débris, with two veins, one of quartz and the other of calcspar. These veins must have been produced by subsequent openings and fillings of those openings and along the original line of fissure.

"About 100 yards to the north-east in the gully is a second cross-course, displacing the lode one fathom; and still, about 100 yards farther, a shaft is sunk on a third, which displaces the lode three fathoms in the same direction; and, again, in the railway cutting close to the station, is a fourth, running in a north-westerly direction, which must have displaced the lode for some distance, as it cannot be seen in the granite face of the cutting on the other side of the railway. This last is very wide, but varies much. It consists of a highly siliceous clay (containing about 75 per cent. of silica), and has evidently been formed of granite débris. It is quarried and used as a fireclay for the smelting furnaces, some hundred of yards away from the point where it faults the lode.

"A small vein of similar character to the lode is running a little more to the east of north; it, too, can be seen in the railway cutting, and is faulted by the cross-courses.

"There are also numerous other cross-courses which, though they do not displace the lode, yet often affect the ore in the lode, either by breaking it up into strings, or by displacing it from one side of the lode to the other. At these points of intersection the lode is usually enriched.

"A dyke of orthoclase porphyry runs parallel with the lode, and is displaced, too, by the cross-courses.

"Two dykes of dolerite also cross the line of lode in a north-westerly direction.

"This mine, notwithstanding the very low price of copper, is still being worked; smelting works are attached, and two furnaces were at work. At present the copper is being sent away in the form of coarse or blistered copper. The refining furnace is in course of reconstruction, having been taken down to give land necessary for the railway works.

"The *Canterbury* and *Normanby* mines are on adjacent selections to the north. Rich yellow ore was obtained from the *Canterbury*, containing 33 per cent. of copper; and the *Normanby* has from three to four feet in width of ore, but a large amount of iron pyrites mixed with it. These lodes are also intersected by cross-courses. Smelting furnaces were erected on the *Normanby* claim.

"Twelve miles nearly due west of Mount Perry are the *Mungai Lodes*. They have an east and west course. The country is actinolite schist. Blue and green carbonates of copper are being raised by the Mount Perry Company for smelting with their ores.

"Three miles to the west of the *Mungai* is the *Potosi Lode*. It bears east and west, and contains galena, with copper and iron pyrites and a little zinc-blende in a gangue of quartz and barytes (heavy spar). The outcrop is of a yellowish red gossan, and from its general appearance it is not unlikely to contain gold. I do not know the amount of silver contained in the galena. The shafts have fallen in. A dyke of porphyry runs in a north-easterly direction about 200 yards east of the main shaft. Between here and the Reid's Creek reefs there are several similar lodes containing argentiferous galena.

"The *Wolca Lodes* are situated six miles north of Mount Perry. Among the principal mines were the *Victoria Company's*. On their selections two parallel lodes, running north, 40 degrees east, and underlying slightly to the north-east, have been worked. They contain rich pyrites in a quartz and calcareous veinstone. The granite vein contains hornblende in the place of mica.

"From the heap near a lode, a little to the north of these, I obtained some large crystals of azurite and quartz, evidently from a drusy cavity.

"The *Wolca Company's Lode*, bearing east 10 degrees north, is at first perpendicular, and then underlies 12 degrees to the north in a fine-grained hard granite. The lode runs over the ridge rising from Drummer's Creek. On the east side of the ridge it has been worked by means of tunnels driven into the hill. Several other lodes in this district have been prospected; their positions and directions are shown on Map No. 2.

"The *Allendale Lode*, seven miles from Mount Perry, has a west 35 degrees north course, and underlies slightly to the south. It is intersected by a dyke of porphyry. The gossan from this lode contained 15 dwts. of gold per ton.

"Two miles to the north, again, is the *Fortunatus*. The shaft is 60 feet deep; its course is 15 degrees north of east, and it underlies 5 degrees to the south. The ore is a rich sulphuret, containing 30 per cent. of copper in quartz and calcite, but is very narrow, however, at the depth of 60 feet, being only six inches in width.

"The *Waverly Lode*, a little to the north of this, produced some rich ore.

"In the paddock of Wombah Station are the *British Lion*, *Mulgrave*, and *Albert Lodes*, running in a north-westerly direction. They are of the usual character. The granite adjoining the first of these has carbonates of copper disseminated through it.

"The *Cambria Lode* is from a mile to a mile and a half east of the *Edina*. It was first taken up as a copper lode, and then worked for gold under the name of the "All Nations." It has a north-east course. A small battery was erected here, and several hundred tons of stone put through, which averaged about one ounce to the ton. The gold contained much silver, the average value being £2 10s. per ounce.

"Between the *Cambria* and *Boolboonda Hill* there are several quartz reefs which have been worked for gold; one, which I traced for some distance,

running north, 60 degrees east, in a fine-grained syenitic granite. Some of them have a north and south bearing, and are in micaceous schists. They yield from 15 dwts. to a little over 1 ounce of gold to the ton.

"The *New Moonta* Copper Lode runs north 55 degrees east, and underlies 7 degrees to the north-west. It has been sunk to the depth of 100 feet. The shafts are in a dilapidated condition. I was informed that the ore was 18 inches in width at the bottom of the shaft. The country is of schists and a fine-grained syenite.

"Nearly all the copper lodes in the Mount Perry district contain gold to some extent. Those in the neighbourhood of Boolboonda, however, contain the most."

In addition to the mines above described, copper mines occur in granite or porphyry country in many other localities which are indicated in the map. The deposits will be found described in the writings of Aplin, Daintree, Gregory, Falconer, Rands and others.

The occurrence of gold in a matrix of felspar-porphyry (probably a dyke) at Ban Ban is noted by Aplin in his "Report on the Burnett district." (Brisbane: By Authority 1870).

KILKIVAN MERCURY MINES

These mines have yielded a considerable quantity of cinnabar. The mercury manufactured from this deposit is preferred by the amalgamators at Gympie to the best article of its kind imported.

"Report of the Warden of Gympie gold-field, for 1877." The mines are in porphyry country.

CHAPTER XIV.

BASALT AND DIORITE.

UNDER this head are massed a number of rock-formations of very different ages, and of varying origin.

The oldest bedded traps hitherto recognised in the colony are the dolerites and porphyrites interbedded with the Dotswood beds.

Next in order come the traps of the Bowen River. The sandstone beds, which form the lower series of the coal-field, pass beneath the bedded trappean rocks of Mount Toussaint, Mount Divlin, and Mount Macedon. The traps present a very different aspect according as they are viewed from the dip or rise side. In the one case the long easy slope generally coincides with the surface of a bed. In the other, terraces alternate with almost perpendicular cliffs. Over considerable areas, beds of basalt, and melaphyre decompose to a rich black soil. The amygdaloidal porphyrites form a lighter soil, better adapted than the other for the cultivation of grapes and fruit trees.

It is difficult to find a specimen of the trappean rock which has not obviously undergone considerable alteration. I sliced, and examined with the microscope a specimen from Mount Macedon which appeared more than usually fresh. The ground-mass showed a tangled web of very minute interlacing labradorite crystals, the interstices being filled up with specks of magnetic iron. The augite crystals are generally represented by a zeolitic pseudomorph (prehnite?), although occasionally a nucleus of augite may be detected in the centre of an altered mass. The rock was, in all probability, originally a dolerite.

In Strathmore Creek the trap is exceedingly amygdaloidal, and is full of cavities, which contain prehnite, thomsonite, analcime, and laumonite. With the prehnite carbonate of copper is frequently associated.

The volcanic activity of this district does not appear to have ceased till after the deposition of the upper coal measures, as sheets of basalt altered to "White trap," where they come in contact with carbonaceous rocks such as coal seams, have been again and again injected along the planes of bedding of the stratified rocks.

The basalt of the Stanwell district near Rockhampton, appear to be interbedded with stratified rock containing *Glossopteris*, *Tæniopteris*, &c., and some beds of volcanic tuff associated with the basalts are marked with impressions of plants apparently of lower mesozoic type.

A very extensive area of basaltic lava-flows, and peaks which may represent the orifices in which the lavas had their source, is crossed by the Central Railway between Cometville and Withersfield, and bounds the Dawson and Isaacs Coalfield on its western side. The rock of the peaks was described as "domite" by Leichhardt, who was struck by their resemblance to the extinct volcanoes of the Auvergne.*

These basaltic rocks form the rich soil of the Peak Downs. Geodes of calcedony are very common in the basalts. The zeolites, chabasite, mesotype, and analcime are rarer.

Daintree observes in his paper on the Geology of Queensland (Q. J. Geol. Soc., London, vol. 28, p. 313) that "The southern volcanic areas—viz., Peak Downs and Darling Downs, etc., agree with the 'Lower Volcanic' of Victoria, which have been ejected through fissures, and have in no case a very extensive flow beyond the lines of fracture through which they issued."

The basaltic rocks of the Toowoomba Range are thus described by Mr. Gregory, in his "Report on the Geological Features of the South-eastern District of Queensland":—

"The rocks which were formed immediately previous to the older alluviums are of igneous origin, being basalts, which, in the portion of Queensland under consideration, form the most important feature of the country, not only as occupying the summit of the watershed between the eastern and western waters, but also on account of the

*Journal of an overland expedition from Moreton Bay, to Port Essington: London, 1847.

fertility of the soil resulting from their decomposition, as at least three-fourths of the land which has been cultivated with any degree of success is derived from these igneous rocks.

"The basalt varies very much in character. At Burleigh Head, Point Danger, and Tambourine Mountain it presents well-defined hexagonal columns, sometimes fifteen feet long and three feet diameter; more frequently it is simply massive, some parts being very hard, and others soft and friable. Occasionally it is highly vesicular, the spheroidal cavities being filled with zeolites. This difference of condition does not seem to result from any variation in the chemical constituents; but from the state in which the material was erupted, the softer rock having apparently been ejected in the condition of aqueous mud, and the harder in actual fusion. Near Rosewood, fragments of coal are enclosed in basalt, but the heat has only been sufficient to partially evaporate the bitumen. In the Tivoli Mines, Ipswich, a dyke of basalt has altered the coal to a hard cake, while on the railway line, near Highfields, the sandstone has been baked to a depth of three inches, by a superincumbent mass of basalt.

"This igneous rock may be referred to a very recent date in the tertiary area; for though the date cannot be deduced from included fossils as with sedimentary strata, yet the carbonaceous rocks of the mesozoic period had been long exposed to erosive action, and had become covered by a vegetation which included plants of the tertiary period, as at Clifton Coalmine, on Darling Downs, where, under thirty feet of basalt, large pieces of fossil wood were found, so little altered that it split and warped several inches on being exposed to the air; it was associated with woody seed-vessels (*Conchotheca turgida*).

"The outburst of basalt appears to have occurred after the physical features of the country had nearly assumed their present form, resulting from the prior disturbance and extensive denudation of the mesozoic strata; the eruption no doubt added to the height of the principal ranges by accumulation; but there was little (if any) disturbance in the inclination of the strata it burst through.

"There are no centres of volcanic action in the form of craters, or any evidence of explosive issues of gases with the fluid rock; but it issued from numerous fissures, and, spreading horizontally, covered extensive areas in the first instance. This was followed by several subsequent outbursts from the more prominent points of eruption, and eventually formed hills, which occasionally exhibit horizontal layers, having the general appearance of stratification. The force with which the melted rock was ejected seems to have been limited to what must have scarcely exceeded that necessary to counterpoise the pressure of the adjacent higher masses of the older formations, so that each group of erupted hills has an average maximum of elevation, and present flat tops, which bear the appearance of being the fragmentary remains of an original table-land.

"Near some of the centres of eruption there are considerable deposits of limestone, apparently a tufa resulting from springs of water

rising through the basalt. This limestone contains much silica, in the form of semi-opal and chalcedony; but there are no traces of organic remains.

"The basalt is chiefly developed along the western slope of the Great Dividing Range, extending from Jimbour Station southeasterly to Warwick—a distance of 100 miles, with an average breadth of 25 miles. On the eastern side of the Main Range it forms the central part of the Little Liverpool Range, extending from near Cunningham's Gap north, to the Brisbane River at the junction of the Logan Creek—a distance of forty miles, though the northern part is not continuous, but a series of basaltic hills, which cap the carbonaceous rocks. The bold escarpments of the Main Range, near Toowoomba, are basalt, resting on carbonaceous sandstones."

In the Northern districts we have an immense development of lava-form basalt.

A period subsequent to the deposition of the Desert Sandstone has been marked by great volcanic activity. Basalt has emanated for the most part from volcanic centres, which occur generally in the form of dome-shaped unwooded eminences near the heads of the valleys which have been denuded out of the sandstone table-lands. Conspicuous among these are the "Sisters," at the head of the Endeavour, the "Piebald Mountain," Mount Morgan (Cooktown), etc. These hills do not present a crateriform appearance, but are mere rises, marking the site of the lava eruption, which has spread around them when situated on level ground, or escaped in glacier-like *coulées* down the valleys. These points of eruption bear in fact such relation to the lava-flows as the similar *foci* in Auvergne bear to the basalt there. *Coulées* of basaltic lava have flowed from the *foci* above referred to down the valleys of the north and south forks of the Endeavour river, and have radiated out from Mount Morgan and other centres to the east and north, over the flats between the mountains and the sea, where they form by their decomposition a chocolate-coloured soil of great depth, peculiarly fitted for agriculture.

When the basalt has decomposed into soil on the spot, it gives rise to open well-grassed country, almost bare of trees. Where, on the other hand, the soil has been re-deposited in alluvial flats on the sides of the river courses, it is usually covered by dense tropical jungle.

The surface of the basalt *coulées*, as well as of the dome-shaped centres of eruption, are frequently scoriaceous in a marked degree, forming spongy masses, light and porous as pumice-stone. Occasionally the basalt of the *coulées* is columnar, as at the Waterfalls in the Endeavour, between Williams Station and Brannigan's. There the basalt is of the usual character, but contains occasional hornblende crystals, and much olivine. It also contains lievrite in geodes.

Gate's Look-out is a volcanic centre of a different character—the deep-seated stump or "neck" of a crater, which once discharged showers of ashes. It forms a conspicuous mountain of tuff, and can be seen from Isabella Creek to cut through the escarpment of a thick bed of the Desert Sandstone. The rock is an agglomerate of volcanic

debris, with a certain rude bedding—courses of larger alternating with courses of smaller bombs—having a dip to the east at about 15 degrees. That the bombs are not detached fragments of an already consolidated rock, but have been consolidated from a molten mass while whirling through the air, is proved by the spherical envelope of vesicular basalt which invariably enfolds them. The interior of the bombs, which range from an eighth of an inch to a foot in diameter, is a mass of black and green crystals of augite and olivine.*

Probably of the same age as the volcanic rocks of the Endeavour and McIvor, are the *coulées* of basaltic lava which partly fill up the valley of the Mulgrave River. On ascending from the Mulgrave on the western side of the valley, the edge of a series of basaltic rocks is seen resting on granites and the schists and slates of the Mulgrave Goldfields. These basalts, in horizontal beds, form a table-land, at an elevation of between 2,000 and 3,000 feet, which extends from the brow of the coast range to the base of the hills in which the Herberton Tin Mines are situated. This table-land is covered with the most magnificent tropical jungle, through which hardly a ray of sunshine can penetrate. The basaltic soil and a heavy rainfall have combined to produce in this region an almost incalculable wealth of cedar and other valuable timber. The luxuriant beauty of these forests beggars description.

“Such primal naked forms of flowers!
Such letting nature have her way!”

A great Crater Lake is to be seen in the middle of this table-land, between the head-waters of the Barron and Johnstone Rivers.

Flows of basalt are also met with in the valleys of the Herbert and Burdekin, and give rise to the rich alluvial sugar lands at the mouth of these rivers. A hot spring occurs in the basaltic country, near Woodleigh Station.

The granite range, dividing the Burdekin and Flinders waters, is crossed by the Townsville-Hughenden road at an elevation of 3040 feet above the sea level. It is flanked on the eastern side by deposits of basaltic lava extending to Dalrymple on the Burdekin. On the western side similar basaltic lavas extend to Tatoo Camp, seven miles above Wongalee Station. Here, at an elevation of 1840 feet, the lowest bed of basalt is seen resting on the Desert Sandstone. Outliers of the basalt occur between Porcupine Creek and the Flinders, as far as Mount Beckford.

It is highly probable that these basaltic lavas, of which all that can be said with certainty is that they are newer than the desert sandstone, are, as Daintree conjectured,† “contemporaneous with the upper volcanic series of Victorian geologists, probably of Pliocene Tertiary age.” They may, like the Victorian basalts, cover rich

* “Report on Explorations in Cape York Peninsula,” 1878-9. By R. L. Jack. Brisbane: By Authority, 1881.

† Q. J. G. S., London, vol. xxviii., p. 313.

auriferous alluvia. We have already seen that they cover stanniferous drifts in the neighbourhood of Herberton.

Dykes and intrusive masses of basalt and diorite intersect almost all of the stratified and most of the plutonic deposits in the colony. Some masses mapped as "Diorite" (*e.g.* that of Mount Frederick near Townsville) are most probably metamorphic rock.

CONCLUSION.

THE aim of the preceding pages has been to give a plain matter-of-fact account of the present state of Queensland geology. The writer hopes to publish in a year or two, with the co-operation of Mr. Robt. Etheridge, junior, a complete Geology of the Colony.

In that work the fossils which are only named in the present handbook, as well as many others which are now under examination, will be figured and described.

The reader may draw his own conclusions as to the origin of the metalliferous deposits; the relations of the Colonial formations to the European; the introduction of extinct and living animals and plants to the Australian area; the Australian range (in time) of forms of life more restricted in better known lands; the mingling of forms in a single Queensland formation, which elsewhere have to be sought for in two or three; the incongruities which generally exist between the faunas and floras of most of the Queensland formations; the dates of the mountain chains, and the former connection of Australia with Continental land. These and other large questions could not be discussed in the present handbook.

COLONIAL AND INDIAN EXHIBITION OF 1886.

CONTRIBUTION TO PHARMACY FROM QUEENSLAND,

BY

JOSEPH BANCROFT, M.D.

A GREAT portion of Australia is covered with trees of the Myrtle family, and the Gum-tree forests, occupied by trees of the genus *Eucalyptus*, are among the most healthy places in the world for human habitation. The *Eucalypti* numbering, according to the *Flora Australiensis*, 135 species, have among them some of the largest known trees. The timbers of many are valuable for building purposes, are very heavy, and cannot be floated. Some are extremely compact, and are consumed with great difficulty by fire, while others more porous are excellent fuel. Some have an agreeable scent whilst burning, and the Moreton Bay ash yields, when fired in a suitable manner, a peculiar crystalline pleasant-smelling body like benzoic acid, the properties of which have not yet been investigated. The tars have been carefully examined in Victoria by competent chemists, but the products of the destructive distillation of Queensland gum-trees have not yet been inquired into. The barks of some *Eucalypti* are smooth; with some, a skin of varying thickness, from $\frac{1}{30}$ to $\frac{1}{20}$ of an inch, is cast off every year in flakes of various forms before or about midsummer; whilst others retain their bark, which becomes of great thickness and more or less infiltrated with gummy secretions. Some of

these are called Ironbarks, more fibrous ones Stringybarks. Many trees of the genus cast off the upper bark only, leaving the tree smooth above and retaining the bark lower down. These are called Butts, such as the Black-butt, *E. pilularis*, one of the largest trees north of Brisbane.

Some barks are very inflammable, stringybark is used for torches, iron-bark for heating wheel-tires, while others like the Box of the Darling Downs, *Eucalyptus populinea*, being almost incombustible, can be made into chimneys.

Queensland ironbarks have been employed with some success, for tanning leather, and Brisbane fishermen use them for preserving their nets. All Eucalypt barks contain a form of tannin, and blacken the iron used to cut them. When the barks are wounded, perforated by insects, or become diseased, liquids exude, which harden by exposure into gums of many kinds. These gums are more or less astringent by virtue of many forms of tannin, are antiseptic, and in a few instances, aromatic.

When first discharged from the tree, the gum may be colourless or slightly reddish and soluble in water, but in time it becomes darker, and lastly jet-black, a large portion being then quite insoluble in water or in alcohol.

A second variety of gum, in two species, is associated with a resinous body, and becomes, in water, white, soft, and slightly elastic, the colouring matters being dissolved out. One sees this in riding among gum trees in rainy weather, the pasty gum hanging to the trees in white masses.

When gums become imprisoned within the layers of wood they may remain there fluid for long periods. On a tree being cut with the saw or axe, this fluid to the extent of many gallons, may run out, as in the case of the Bloodwood; or the fluid having become dry, hard vitreous concretions may be found among the woody layers. The timber of this tree is generally rejected at the saw mills, but is much used for split fences.

All Eucalypt woods containing tan principles, last well so long as the tan is contained in the fibre, but after these matters have been washed out by rains the wood begins to decay. In the case of bloodwood much of the tan is no longer soluble, and the wood is very durable out of doors. Shingles—split wood—used for roofing instead of slates yield to the rain an astringent colouring matter that renders the roof-water collected therefrom unpleasant for some years.

Eucalyptus charcoal made by the aborigines of Moreton Bay from the burnt bark of *Eucalyptus corymbosa* is used by them as an antiseptic application for wounds. The saplings are covered with a soft fibrous bark, and make a light spongy charcoal mixed, probably, with some unburnt kind.

Besides the gums and oils of the myrtaceous plants examined, this contribution contains an account of *Duboisia* and allied mydriatics; of the barks of *Nesodaphne*, *Achras* and *Alstonia*; and of the wood of the great pepper, *Piper novæ-hollandiæ*.

There is yet a large number of plants, some promising to be of considerable value, partially investigated only, to do justice to which the writer has not yet been able to devote the necessary time.

MYRTACEOUS PLANTS.

(For botanical descriptions see *A Synopsis of the Queensland Flora*, Brisbane, 1883, by F. M. Bailey, F.L.S.)

EUCALYPTUS ACMENIOIDES (STRINGYBARK).

Bark used for roofing and for torches. Gum, newly exuded, is in small quantity of amber colour, passing to red and black; soluble in water when recent, and of similar composition to that of the common ironbark. Foliage containing little or no volatile oil. Wood pale, giving out tannin to roof-water when used for shingles, is also good for fencing, and used at the saw mills.

EUCALYPTUS HÆMASTOMA (SCRIBBLY GUM).

Casts all its bark annually. Bark marked by an insect in the form of an irregular W placed on end. These markings are most numerous on the south side of the tree, where the sun has least power. The bark is also covered with warts, as large as the point of the little finger, which shelter a beautiful scarlet acarus, to be seen by the microscope. Gum is soluble in water, and when dried forms shining scales. Its chemical composition is similar to that of the common Ironbark gum. Foliage is highly aromatic, the young leaves having a smell like peppermint. On distillation the yield of oil is found to be abundant. The timber is of an inferior kind, and rejected at the sawmills; but used to some extent for fencing-rails. For pharmaceutical purposes this is one of the most interesting gum-trees, yielding a valuable gum, and a pleasant Eucalypt oil. The bark of this tree is deserving of study, and as it is the only bark attacked by the insects, forming the W marks, and by the scarlet acarus, it is likely to have a different organic composition to the barks of the neighbouring Eucalypti.

EUCALYPTUS MICROCORYS.

The large, red, stringybark, or turpentine tree. The largest tree of the higher lands in the neighbourhood of Brisbane. Protected by legislative enactment from being cut by timber-getters. Among the stringybark of this tree, at injured places, may be found a brownish gum, differing a little from that of the common stringybark, but much more plentiful. This gum is soluble in water, and when evaporated yields brownish scales. It possesses the usual property of this class of Eucalypt gum, darkening by age, and becoming less soluble. The foliage yields a strong smelling Eucalypt oil in great quantity. The wood is yellowish, and is much used at the sawmills. This tree thrives well in India, and from seeds supplied to Dr. Dymock one grew 30 feet in two years. The writer believes the naked mountain ranges in the neighbourhood of Bombay could be covered by this magnificent tree, and so, in course of time, lessen the necessity of importing so much Australian timber for railway purposes.

EUCALYPTUS HEMIPHLOIA.

A gum of the kind before described, exudes in moderate quantities. The foliage yields no oil. Timber not of much value.

EUCALYPTUS SIDEROPHLOIA (THE COMMON IRONBARK).

This tree is covered with a deeply furrowed, black, heavy bark used by smiths to heat their wheel tires; and by tanners in preparing a black, hard sole leather. It exudes a gum in great plenty, at first pale yellow, in long tears. The gum darkens into bright red, eventually black, becoming then more insoluble. It has been used by the writer as a substitute for catechu. A tincture, made with $2\frac{1}{2}$ ozs. to the pint of proof spirit, is valuable as an astringent in diarrhoea. In course of time this tincture gelatinises in a similar way to the kino tincture of Pharmacopœia. The foliage contains no volatile oil. The wood is dark coloured, very heavy, splits easily, and is much used for building purposes. As a fence material it lasts well in the ground, but is eaten to some extent by white ants. Made into shingles it colours the water with its tannin for many years.

EUCALYPTUS SIDEROPHLOIA.

This has more lamellar bark than the preceding, and is without doubt a distinct species, as is evident both by the characters of the foliage and bark. The gum is of a similar character to that of the common ironbark, though somewhat lighter in colour. The large and coarse foliage contains no volatile oil. Timber is valuable, reddish, and heavy, but the tree is often hollow in the centre from decay.

EUCALYPTUS TERETICORNIS (BLUE GUM OF BRISBANE).

Throws off its bark, but with less facility than some other species. A very little brownish red gum, similar to that of *Eucalyptus microcorys*, can be occasionally collected from this tree. The foliage contains a volatile oil of similar odour to the commercial *Eucalyptus amygdalina*, but not in abundance. The bark, like the bark of all eucalypts, contains tannin. The wood is much used at the saw mills; also by fencers. It burns with difficulty.

EUCALYPTUS SALIGNA (THE GREY GUM),

Casts its bark but slowly, and the stem of the tree rarely looks clean. From the bark no gum can be collected. The foliage contains a little oil. The wood is valuable.

EUCALYPTUS RESINIFERA (A ROUGH STRINGY BARK).

Called by timber-getters "Jemmy Low," apparently the same tree as produces the Botany Bay Kino, but further investigation is needed.

In the *Eucalyptographia* of Baron von Müller, will be seen an account of the gum of this tree being used in the early days of Botany Bay by D. White as an astringent; and an analysis by Hayne mentions cold

water dissolving only one-sixth by weight of the gum. As has been before mentioned, the newly exuded gums are soluble in water; the old gum almost insoluble. Old gum is soluble in alcohol, older gum insoluble. An illustration of this change may be seen when tincture of Kino of the Pharmacopœia, made with Malabar Kino and rectified spirit becomes gelatinous. This change, by age in the composition of Kino, may account for the discrepancies in the various analyses published.

ANALYSIS OF MR. STAIGER, JANUARY, 1886.

The gum of *E. resinifera* is perfectly soluble in cold distilled water. It consists of Kinotannic acid (54 per cent.) and a kind of Gum Arabic. These two bodies seem to vary in their occurrence with the age of the gum; in the older, the Kinotannic acid becomes higher in percentage, and the Gum Arabic disappears partially. The gum is nearly the same as that of *E. hæmastoma*.

Eucalyptus resinifera grows at the Eight-mile Plains. Some of the largest trees known to Mr. F. M. Bailey are to be found at the Maroochie River. The samples of crude gum in the Colonial Exhibition are collected by Mr. Williams, nurseryman, whose knowledge of the eucalypts of Queensland is extensive and practical.

EUCALYPTUS TESSELLARIS (THE MORETON BAY ASH).

The bark is deciduous on the upper parts of the tree; on the stem, near the ground, it remains in irregular quadrangular pieces—hence its name. The gum of this tree differs from all the before-mentioned gums; it runs from the tree the colour of dark brown treacle, without any tint of redness, passing on to black. It smells sourish. Exposed to the air it becomes hardened externally. Water whitens and softens it, dissolving the coloring matter. In the mouth, this adhesive mass reminds one of the gluten left after chewing wheat, but is not so elastic.

Mr. Staiger gives the following analysis:—

GUM OF EUCALYPTUS TESSELLARIS.

A bright, shining, reddish-looking gum, of 1.35 spec. gravity. Alcohol, especially if warm, dissolves the whole of the gum, leaving only the impurities behind. Cold alcohol is apt to leave some catechin undissolved behind. Part of the gum is soluble in cold water, to which it imparts an astringent taste. When powdered gum is treated with boiling water, 66 per cent. become soluble therein and 26 per cent. remain insoluble, forming a non-adhesive gum, and 8 per cent. are impurities. This would make for pure gum 71.7 per cent. soluble in boiling water and 28.3 per cent. insoluble. The solution of the gum in water is clear as long as it is boiling, but in cooling it soon becomes turbid, and a heavy copious deposit takes place. This deposit has a buff colour, and consists principally of catechin. With salts of iron it gives at once a dark blue precipitate. When the gum, which remains undissolved in boiling water, is dissolved in alcohol, the alcoholic solution filtered and evaporated to dryness, a plastic transparent reddish gum remains behind. Out of this residue ether dissolves one-fourth with a reddish colour and a very slightly sweetish taste. The residue from the etherial solution forms a pliable, reddish, transparent mass, which does not become quite dry even after the lapse of 4 to 5 days. What remains of the alcoholic dry residue after treatment with ether forms a dark coloured, brittle mass identical with Shellac, of which it possesses all the qualities chemically as well as technically, giving a good French polish. It is, however, of a darker colour than the usual commercial article. This Shellac constitutes 1-5th of the whole gum, and is totally insoluble in Benzene, Kerosine, and essential oils.

The wood of the Moreton Bay ash is heavy, not much used in Brisbane for economic purposes, but in the northern part of the colony is found valuable, leading to the supposition of the northern tree being of another species. When sawn up the Brisbane grown timber cracks longitudinally. It is very combustible, and dead trees will burn away entirely, root and branch, often without assistance. At times one finds a woolly mass in partially burnt logs which is found to be a white crystalline body like Benzoic acid. This substance may be revolatalized and collected, of pure white colour, under a cold bell-glass. It has a pleasant odour of Benzoin, but has not been further investigated.

EUCALYPTUS CORYMBOSA (THE BLOODWOOD.)

Has a persistent rough bark. The gum which at times exudes in great plenty is a bright red fluid of the consistence of treacle. It often becomes imprisoned between the layers of wood, and in felling a tree the workmen have occasionally to wait some time for the fluid to run out, so greatly does it interfere with the use of their tools. Often this imprisoned gum sets hard among the woody layers and may be broken out in quantity. The gum of the bloodwood varies from being soluble in water to complete insolubility both in water and alcohol. The recent gum is bright red, brittle, and reduced with ease, in the mortar, to a fine pink-white powder. It is then very astringent, and leaves after solution in cold water a little whitish, insoluble, powdery substance in the bottom of the vessel. The insoluble gum that lies between the layers of wood may be seen in small angular pieces on fences after years of exposure to sun and rain. The wood is consequently very lasting. It is rarely used at saw mills from the number of kino veins running through it. The bark is used by the aborigines of Moreton Bay to make charcoal for their wounds. The foliage contains no oil.

EUCALYPTUS MACULATA (SPOTTED GUM.)

Bark deciduous; where wounded it throws out a brown treacle-like gum, which hardens into large masses. When these are disturbed they give off an aroma like benzoin with a suspicion of a gas-works. In other respects this gum is like the sour-smelling gum of *E. tessellaris*. During rain the gum softens and whitens and has a remarkable appearance on the trees. When dry the colour again becomes brown. Mr. Staiger's views on the composition are as follows:—

“Staigersleigh, Brisbane, 7th January, 1886.

“DR. BANCROFT,

“DEAR SIR,—At your request I made a careful investigation of the gum of *Euc. maculata* which you gave me.

“The gum in question was of a brownish colour and very porous. The cells which constituted the porosity were filled with a gas possessing the exact smell of benzoin or benzol when in a pure state.

The gum is totally soluble in alcohol, and in boiling water are 60% soluble and 40% insoluble.

"The watery solution possesses the flavour of gum benzoin.

"It contains benzoic acid in an impure state, and also catechin.

"The gum which was insoluble in water was of a sticky nature. When dissolved in alcohol, and the solution evaporated in the air without artificial aid, a sticky, clear, reddish-brown, tasteless gum remained. If this is treated with ether, the sticky part of the gum goes into solution, and a dry, clear, reddish, tasteless, brittle gum remains, possessing all the properties of shellac.

"Yours truly,

"KARL THEODORE STAIGER."

The foliage of the spotted gum has a powerful odour much like the commercial eucalyptus oil distilled from *E. amygdalina* in the colony of Victoria.

Nearer the tropics the foliage of *E. maculata* acquires a citron-like smell and the tree has been named *E. maculata* var *citriodora*. Now that Eucalyptus Oil has been discovered, so valuable as an antiseptic, this more pleasant smelling oil is worthy of attention, as in all probability the antiseptic powers are not different from those of *E. amygdalina*, and the odour is far more agreeable.

ANGOPHORA SUBVELUTINA (APPLE TREE).

Gives out a brittle, reddish gum, much used by settlers as a medicine for diarrhoea. Put in cold water it becomes whitish, some portion of astringent matter is dissolved and a bulky, whitish, powdery substance subsides, which when shaken up, does not cohere or in any way resemble the insoluble adhesive gum of *E. tessellaris* and *E. maculata*.

This is a pleasant shade tree for pastures but is not put to economic uses to any extent.

ANGOPHORA LANCEOLATA.

Scarcely to be distinguished from the spotted-gum by the stem or bark of the tree, even by experienced persons. When in flower having petals, it can be easily distinguished from Eucalyptus. The foliage contains no volatile oil, so that by the absence of the oily odour it could be distinguished easily, but the foliage may be a long way out of reach. The gum, however, is quite different from *E. maculata*, being liquified by the rains and run into red brittle streaks. When dissolved in water it behaves much like that of *Angophora subvelutina*, leaving a whitish, insoluble, powdery deposit.

In that excellent monograph the *Eucalyptographia*, the learned author has admitted, in a report of an analysis by Dr. Julius Wiesner, a statement that the gum of *Eucalyptus maculata* dissolves easily in hot water, &c., &c. There is no doubt, however, that the gum of this *Angophora* was under consideration and not the gum of *E. maculata*.

SPECIMENS EXHIBITED.

VOLATILE OILS, Distilled from the Foliage of Trees of
the Natural order Myrtaceæ.

The foliage of many Eucalypti contain volatile oil in translucent cells, easily seen when the leaf is held up to the light. Some, however, contain no oil. The oil of different Eucalypts varies, and that of the young foliage is generally of more delicate odour than that of older leaves.

Some have a coarse, heavy, uninviting smell, while others rival the finest lemon oils. All probably have the same antiseptic value, and, in course of time, the more agreeable ones may be expected to displace those in common use.

BACKHOUSIA CITRIODORA

Is a tree of variable size growing near or in scrubs, rather scarce in the coast districts. The leaves yield when bruised a powerful odour of lemon. The oil distilled from the foliage is very similar to that of lemon grass. By age it becomes yellow and resinous. So far as experiments have gone its effects are similar to the oil of lemon grass.

MELALEUCA LEUCADENDRON.

The paper bark or Ti-tree, very similar in general appearance to the Birch of Europe but with differently shaped leaves. Other species of Melaleuca and Callistemon growing in the neighbourhood of Brisbane yield oils of similar odour, but the trees are not plentiful. *M. leucadendron* is a very common tree in marshy country. The bark separates in thin papery layers, and is used by the aborigines for torches, and in roofing their sleeping places.

Volatile oil is given out by the foliage during moist warm weather in great quantities, strongly noticeable in travelling through ti-tree country.

When the leaves are bruised the oil is freely set at liberty. The odour is like that of the Cajuput oil of Singapore, but more agreeable. Small insects imprisoned in an atmosphere of Melaleuca oil become intoxicated. The writer has used the oil as an antiseptic inhalation in Phthisis. It is more volatile and agreeable for this purpose than the Eucalyptus oil of commerce.

EUCALYPTUS MICROCORYS (THE GREAT RED STRINGYBARK OR
TURPENTINE TREE).

The oil has been employed in a similar way to the Eucalypt oils in common use. Not a very agreeably smelling oil.

EUCALYPTUS HÆMASTOMA

A plentiful oil, and among the more agreeable forms of Eucalypt oil. Very clear.

EUCALYPTUS MACULATA, VAR CITRIODORA

As before mentioned, when speaking of the gum of *E. maculata*, this is one of the most agreeable of Eucalypt oils and worthy of particular attention.

EUCALYPTUS STAIGERIANA.

A small Ironbark from Northern Queensland the foliage of which is rich in lemon scented oil. The only tree of this species, in Brisbane, grows in the garden of Mrs. C. Coxen, a lady who has assisted materially in the furtherance of the study of natural history. A small quantity of the gum gathered from this tree dissolves completely in cold water, and has an appearance like that of the common Ironbark. The oil being the most agreeable of all Eucalypt oils discovered should be brought into use, to the exclusion of the less agreeable forms.

PARTICULARS OF EUCALYPTUS OIL, SUPPLIED BY MR. STAIGER.

		Specific Gravity.	Specific Gravity. Dried.	Temperature	Per Ton in Ounces.	Per Cent.	State of Material.
<i>Eucalyptus hamastoma</i>	s. acid	0·880	0·878	60	672	1·875	fresh leaves
„ <i>microcorys</i>	acid	0·896	0·894	„	375	1·960	„ „
„ <i>Baileyana</i>	acid	0·890	0·888	„	322	0·900	„ „
„ <i>Planchonia</i>	—	0·915	—	„	21½	0·060	„ „
„ <i>maculata</i>	neutral	0·891	0·889	72	—	—	„ „
„ <i>maculata</i> , var. <i>citriodora</i>	„	0·892	0·890	„	—	—	dry „
„ <i>Staigeriana</i>	s. acid	0·871	0·880	„	1200	2¼-3	„ „
<i>Melaleuca leucadendron</i>	s. acid	0·917	—	60	320	0·895	fresh „
<i>Backhousia citriodora</i>	s. acid	—	0·887	72	—	—	dry „

The oils when fresh contain from 0·1 % to 0·3 % of water dissolved, which can be easily removed by chloride of calcium.

EUCALYPT GUMS, prepared for purposes of Pharmacy.

EUCALYPTUS SIDEROPHLOIA.

Gum dissolved in water, clarified, and evaporated on glazed surfaces.

This gum, so purified, forms curved shining angular fragments of a dark reddish-brown colour. The composition is uniform, and is available for the making of tincture and other articles, as experience may suggest. It is not easily reduced to powder, but dissolves readily in warm water.

Purified Gum, 2½ ounces; Proof Spirit, 1 pint. Dose for diarrhoea, dysentery, &c., 20 to 60 drops, repeated every three hours. May be used, diluted with ten parts of water, as an astringent antiseptic gargle.

EUCALYPTUS SIDEROPHLOIA VAR ROSTRATA.

Gum dissolved in water, and evaporated as previously described, yields a gum of more red colour than that of the common Ironbark, and may be used in the same manner.

EUCALYPTUS HÆMASTOMA.

Gum dissolved in water, and evaporated as before mentioned.

This gum forms thin brilliant shining plates of larger dimensions than the Ironbark gum, and may be used in the preparation of tincture. The writer has applied these shining plates over cuts and ulcers, to promote the healing process, and has so far reason to be satisfied with the results.

EUCALYPTUS RESINIFERA.

Gum dissolved in water, and evaporated as before mentioned.

Brown shining pieces, rather tough, very like the purified Ironbark gums. It may be used in the same manner.

EUCALYPTUS CORYMBOSA.

The recently exuded gum of the Bloodwood bark, avoiding that from the centre of the tree. The gum dissolved in warm water, and evaporated as before mentioned.

It is more brittle than any of the preceding, and may be reduced to a pink white powder. It can be made into tincture in the same proportions as that of the Ironbark. It is the most convenient of the purified gums to make into powder or pills.—Dose of the powder, 2 to 10 grains.

ANGOPHORA WOODSIANA.

The gum of this species, as well as those of *A. subvelutina*, the Apple Tree, and *A. lanceolata*, Bastard Spotted Gum, dissolves to a great extent in hot water. As the solution cools, a pinky white precipitate occupies the whole volume of the liquid. When filtered hot, and evaporated on glazed surfaces, a red purified gum remains, which differs from the eucalypt kino gums in not curling up and leaving the plate. The purified *Angophora* gum is a reddish powder, and may be used as an astringent in diarrhoea in the same manner as the gum of Bloodwood, to which it bears the nearest resemblance. The chemical composition, however, differs from that of the eucalypt gums, and is deserving of further investigation.

In adapting the eucalypt gums to Pharmacy, it will be advisable to inform the collector that only newly discharged gums should be gathered, and it would be well for him to make v shaped incisions in the trees, with a small cavity at the point of the v to hold the gum. These recent gums should then be dissolved in hot water, and all extraneous matter removed, when the solutions should be evaporated in the sun, or by gentle heat on glazed surfaces. The gum under these processes dries and cracks up into the forms now exhibited. By thus purifying such variable substances as eucalypt gums, some regularity of composition may be arrived at, and the prescriber will not then be disappointed in obtaining uniform results.

OTHER MATERIA MEDICA.

NESODAPHNE OBTUSIFOLIA, BENTHAM, *Flora Australiensis*, vol. V., p. 299.

(NAT. ORDER, LAURINEÆ.)

A tall tree growing in the rich scrubs to the north of Brisbane. Bark grey and rough externally, reddish-brown internally.

It has a strong, aromatic odour, and pleasant astringent taste. Frequently used by bushmen to improve the flavour of their tea, a little bit of bark being infused therewith.

The active principles are a volatile oil with an odour like the North American Sassafras, and a peculiar tannin. This bark has been used by the writer as a convenient aromatic astringent in Diarrhœa and Dysentery, having the properties of Cinnamon and Catechu in combination. It is most conveniently used in the form of a tincture made with two ounces of the bruised bark in a pint of rectified spirit.

Mr. Staiger says:—"The bark of *Nesodaphne* contains about two per cent. of volatile oil heavier than water, and nine per cent. of tannin. The latter colours iron solution green, does not precipitate solution of glue and behaves itself similar to the tannin of the Peruvian bark."

ACHRAS LAURIFOLIA F. MUELL., *Flora Australiensis*, vol. IV., p. 281.

A sweet bark growing on a tree about 90 feet high in the rich coast scrubs; introduced, together with the *Nesodaphne*, to the notice of the writer by the late Mr. James Low, of Maroochie River. Mr. Low also pointed out the purgative nature of a fruit of a Proteaceous bush, *Macadamia Youngiana*, *F.v.M.* The subject of this communication has not received any further experimental investigation.

Achras bark is chewed by the natives at times as a nutritive article. The analysis of Mr. Staiger shows it to contain a substance like liquorice sugar, india-rubber, and tannin.

It has been made into a sweet tincture, and Mr. Staiger has made a lozenge of the extract; which, being sweet and astringent, may be valuable in throat diseases.

ANALYSIS OF THE BARK OF SWEET BARK.

Extract containing Glycerhizin	...	30.00
Tannin		12.00
Caoutchouc (intermediate between Gutta		
Percha, and true Caoutchouc)	...	0.25
Dry, exhausted bark		50.00
Moisture		7.75
		100.00

K. TH. STAIGER.

ALSTONIA CONSTRICTA, F. MUELLER, *Flora Aust.*, vol. IV., p. 313.

BITTER-BARK OF THE COLONISTS. (NAT. ORDER, APOCYNÆ.)

When this bark was first given to the writer, then residing at the Brisbane Hospital, by a bushman, in 1868, no information as to its source could be obtained in Brisbane. At the same time a bark

called Cinchona was much spoken of as a valuable bitter, and Mr. George Raff forwarded some of it from his estate at Caboolture for examination. This proved to be another bark, the bitterness of which was due to a peculiar tannin, consequently no further efforts were made to adapt it to pharmacy. This so-called Cinchona is the *Petalostigma quadriloculare*, a small Euphorbiaceous tree common in the coast country, bearing a yellow crab-like fruit the size of a boy's marble. But the source of the piece of yellow non-astringent bark was still a desideratum.

Mr. Merrett, Dispenser to the Hospital, shortly after went to reside at Dalby, and found on enquiry that Mr. Surveyor Twine knew where this yellow bark grew. The writer then made a visit to Dalby, and with the late Mr. Blaxland drove out and obtained sufficient bark for experimental purposes.

The ordinary observer will find *Alstonia constricta* to be a small tree with rough bark. On the colder plains frequently only rough, humpy roots are to be seen, with a few small shoots, the foliage being much destroyed by a caterpillar, which produces a pretty, green moth. In warmer parts the tree grows 40 feet high, and is not so much injured, though every year the foliage of the upper shoots is drawn together by the caterpillars, and the woody parts only left. The inner bark of the tree is yellowish, and makes no black stain on the axe. The leaf is like that of a peach, but softer, and when broken off the foot stalk gives out milky juice. The flower is inconspicuous, and the fruit two long horns the length and thickness of a pen-holder. These, on opening out, discharge seeds with silky down attached.

The bark when removed should be dried quickly, in the sun or shade and protected from wet. *Alstonia constricta* bark gives out to water and alcohol a yellowish principle, intensely bitter, not easily made to assume any crystalline form. When the tincture is poured into water the mixture becomes fluorescent, and excepting a slight yellowness, is not easily distinguished either by color or taste from a solution of Quinine. Its utility as a general tonic is established beyond doubt. Indeed if any powers are left a debilitated stomach will respond to *Alstonia*. *Alstonia* has been used in the earlier stages of Typhoid fever with considerable success. No unfavorable symptoms are produced by it, but patients complain of a bitter taste in the mouth, remarking that they consider themselves bilious. After 15 years of experience of the use of *Alstonia* the writer is of opinion that there is no better or more generally useful tonic.

The tincture made with three ounces of the bark to a pint of proof spirit is the form generally used, the dose being from five to ten drops. The powder in grain dose, made up with extract of liquorice forms a convenient tonic pill. An alcoholic extract made by Mr. Staiger is a much more powerful remedy, but experiments are wanting to determine its special utility. It may be here mentioned that Mr. Merrett's extensive knowledge of the natural history of the Darling Downs may be found of much value to further investigations.

DUBOISIA MYOPOROIDES, R. BR., *Flora Aust.*, vol. IV., p. 474.
(NAT. ORDER, SOLANACEÆ.)

A small tree growing in the coast country, the leaves and bark of which contain a principle in many respects similar to Atropia and Daturine, but with a much more powerful action on the animal economy. Duboisine is a non-crystalline oily-looking alkaloid. In combination with sulphuric acid it yields a crystalline body like brown sugar, the Sulphate of Duboisine, first prepared by M. Petit, of Paris. In this climate where the temperature often ranges above 80 deg. Far. the crystals lose their form.

The juice of Duboisia leaves and fruits acts rapidly on the iris and accommodation of the eye, producing a widely dilated pupil in twenty minutes. Duboisia is now well known to ophthalmic surgeons, having been introduced into practice by the writer in 1878. (See the original communication on this subject made to the Philosophical Society of Queensland, hereto appended.)

Duboisia leaves are eaten extensively by the larvæ of a moth. The excreta of the larvæ when collected in quantity are found to contain the active principle unaltered. As an internal remedy, Duboisia has not been much studied. Doses of the tincture tried in substitution of Belladonna for asthma cause delirious symptoms during the night when used freely.

Tincture of Duboisia.—made with 3 oz. of leaves to the pint of proof spirit, may be used as an external application in place of Tincture of Belladonna. But more experiments are wanting to determine its particular value.

Extract of Duboisia.—The watery extract forms a very convenient drug for ophthalmic practice. A few drops of water put on the top of the extract keeps the drug sufficiently fluid. When the soft extract is applied to the lower eyelid by means of a probe the physiological effect is rapidly produced in a satisfactory manner.

Duboisine.—gr. 1 to an ounce of distilled water will give a solution sufficiently powerful for ophthalmic purposes.

Sulphate of Duboisine.—gr. 2 to an ounce of distilled water is the strength in common use.

In many publications Duboisia myoporoides is confounded with Duboisia Pituri—the Anthocercis Hopwoodii of the *Flora Australiensis*. The Pituri is a small tree growing in central Australia, containing an active principle nearly, if not exactly, identical with nicotine.

The leaves of this tree are chewed by the aborigines.—(See my Papers appended hereto, which were read before the Philosophical Society of Queensland. Also, Papers of Professor Liversidge, of the Sydney University, on the Chemistry of Pituri: read before the Royal Society of New South Wales, Nov., 1880.)

Anthocercis viscosa, growing in South Australia, contains an active principle similar to Duboisin.

Anthocercis Tasmanica has also been carefully examined and found to possess the same powers.

Datura Leichhardtii is a small thorn-apple growing in the interior of Queensland. Its active principle is similar to the *Datura* of Pharmacy.

From *Australian Gardens* other remedies of this class may be obtained.

Datura stramonium and *fastuosa* have become naturalised in waste places and in cultivated grounds.

Datura arborea—called “trumpet flower.” The juice expressed from the petals makes a convenient eye drop without further preparation.

Young children often chew the petals of the *Daturas*, and become flushed and delirious. Emetics to remove the petals and chloroform repeated from time to time to subdue the violence of the muscular disturbance, will be found of advantage.

Solandra lævis and *grandiflora* (natives of Tropical America), are ornamental shrubs, common in Australian gardens; they bear long white trumpet-shaped flowers. Both these plants were investigated some years ago by the writer, and found to contain a principle having an effect on the eye similar to atropine, but not being Australian plants were not further studied.

PIPER NOVÆ-HOLLANDIÆ, MIQ., *Flora Aust.*, VI., p. 204.
(NAT. ORDER, PIPERACEÆ.)

Wood of the large Pepper-vine of the scrub, cut in transverse pieces and dried.

This vine was examined by the writer, on account of its relationship to the great South Sea pepper, *Ava*. It is one of the largest native creepers, the vine at the root being at times from six inches to a foot in diameter. It grows like ivy to the top of the tallest trees, falling then in festoons of lovely proportions. It casts off a small blue fruit, smaller than a pea, in immense quantities. This native pepper seed has not been investigated with care; the taste is not more agreeable than that of the wood. Sections of the wood show the annual layers, and the wedge-shaped portions of woody tissues in a remarkable manner. All parts of the plant contain the active principle, and as a full grown pepper-vine would weigh many tons, a supply of this drug might be made without limit. The active principle, dissolved out of the dried wood by æther, is a brownish oily fluid, non-volatile, with slight smell of the pepper vine. It is soluble in water to a limited extent, the insoluble portion producing an oily emulsion. It has a warm aromatic pleasant benumbing effect on the tongue, when applied to it in minute quantity. The writer has used a tincture internally as an aromatic and in other ways, without any remarkable effect, but has not made sufficient advances to speak of it as a valuable drug for any particular purpose. The æthereal extract, mixed with water, inserted under the skin of frogs or small animals, causes death. Further inquiry is necessary in determining its relationship to the active principle of the *ava* (*Macropiper methysticum*) of the Pacific islands, to the action of which it appears to the writer to bear a strong resemblance. Other pepper woods possess properties of a like kind.

Pipli mul, root of the *Piper longum*, is a favorite remedy of the Hindus. [See Fluckinger & Hanbury.] The leaf of the *Piper Betel* is in daily use by large Asiatic populations, being chewed along with the areca nut. It is probable that the study of the active principle of the various pepper plants might lead to important results. The Queensland pepper-vine then might be looked to as an unfailing source of supply of the active principle.

This study of the history of the native remedy of the
Hindus. (See *Illustrations of Hinduism*). The fact of the
is in danger of being lost, being almost always with
the same result. It is probable that the study of the native
the various paper plants might lead to important results. The
Greenland paper-plant might be looked to as an interesting source
of study of the native principle.

A POPULAR SKETCH

OF THE

NATURAL HISTORY

OF

QUEENSLAND:

BY

PRICE FLETCHER.

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A POPULAR SKETCH
OF THE
NATURAL HISTORY
OF
QUEENSLAND:
By PRICE FLETCHER.

INTRODUCTORY.

OF the many curiosities peculiar to the animal life of Australia, a fair share falls to the colony of Queensland. The immigrant, whether he be a scientific scholar or simply an observer, will find a constant book of novelty open for inspection. It is this charm of novelty which makes this Austral land such a paradise to the lover of nature. No matter what direction a journey is taken, whether into the ordinary forest of the coast, or to the dense jungles of the river banks, or over the vast prairies of the interior, forms new to the eye of the European naturalist will be observed, until at last real pleasure is actually experienced at the relief from novelty which is felt by finding a form almost identical with some well-remembered species of the old world.

Even from the deck of a ship, and before a foot has been placed on land, a feeling of pleasure will be experienced by the naturalist as his glance takes in the vast expanse of forest before him, and he ponders over the fact that its growth is that of the wonderful eucalyptus family of trees, whose medicinal and other virtues are the talk of the world. In imagination he will revel in the happiness of a ramble in a virgin forest of an extent greater than that of an English county—indeed greater than the whole area of England. The land breeze blowing will waft to him a sweet scent, which he will at once pronounce to be that of the mimosa, his book knowledge having previously told him that the acacia family of trees is the one that most successfully combats with the eucalyptus in the struggle for existence against the many vicissitudes of Australian life.

Upon landing, the first journey into this forest will be a drop into wonder-land. The newly-arrived naturalist will see the Eucalypt in its grandest stage of beauty, that is as a gnarled, broken-limbed gigantic old gum tree, whose gray bark is grizzled and ragged, and whose bare branches stretch out to such an extent that the wonder is excited as to how they are sustained. He will notice the peculiarly narrow leaves, with their hardened surfaces, suspended so as not to be constantly exposed to the one ray from the overpowering sun. The bark, hanging in shreds, will attract attention, and on tearing down a strip his entomological fancies will rejoice, for he will see before him

a mine of novelty in the ants, spiders, beetles, &c., that he has dislodged, and in the host of cysalids, nests, and curiosities this one tree has brought to light. A thud, thud on the ground will cause him to turn round, and, to his delight, he will see an animal hopping along, which he at once recognises as the world-renowned kangaroo, and a thrill of pleasure runs through his senses as he realises that at last he has seen a marsupial in a state of nature and in its own wild haunts. Unconsciously he follows the direction it went, when suddenly he is startled by the hurried scamper of a creature from a tussock of grass near by, and away goes another hopping animal, which by its more graceful shape, rapid jumping, and general activity he concludes must be one of the numerous species of the smaller Macropodidæ called *Halmaturi* or "wallabies."

Suddenly shrill, short, sharp screeches reach his ear, and even before he can turn his head to discover the cause, a flock of paroquets whiz with speed of an arrow past, then giving a wheel and a turn in their flight, they with one impulse settle in the gum tree before him. Cautiously he approaches—but the caution is needless, for the birds heed him not—and as he sees the bright green birds hanging in every possible attitude and climbing about among the extreme tips of the twigs, and sucking out the honey and pollen from the small flowers of the eucalypt, he knows that they must belong to that curious group of paroquets which have a brush-tip to their tongue and so are called trichoglossus, and his admiration is excited at noticing how suitable this strange peculiarity is for the work it has to do. Also for the first time in his life he will have brought under his observation how admirably adapted to their mode of life are the scansorial peculiarities of the parrot family, and again he will be astonished at having brought home to his immediate attention that the bright green and yellow plumage so conspicuous upon the bird when in a cage renders it all but invisible when among the leaves and flowers of the eucalypt. Pleased at having facts new to his observation brought before him he hardly notices a rustle beside his feet, but looking unconsciously downwards, a black snake is seen with the fore part of its body raised from the ground, the head flattened cobra-like, and prepared for defence. Instinct tells him this reptile is venomous, and a blow from a stick is speedily bestowed upon it. Then the pleasure of having overcome a really dangerous creature will be another new sensation, and if imbued with the true naturalist fervour, he will rejoice in being in a country where the reptilia are represented in their most interesting form, that of the poison secreting ophidian.

The limits of this paper will permit of no more than the bare mention of some of the chief characteristics of life as found among the animals, the birds, and the reptiles of Queensland. Upon each division a volume could be written, and yet much be left unsaid. The entomologist will find in this country of heat and moisture an inexhaustible field of study, for insect life is truly multitudinous in its developments, so much so that it is useless touching upon it in this essay. Amongst the numerous fishes that abound in the reef-sheltered seas

that surround the coast of tropical Queensland, there is a mine of undiscovered wealth to the student. Fishes of all shapes, some most beautiful, elegant and graceful, others on the contrary, ugly, ferocious—absolutely infernal looking. Their varieties are exceedingly numerous; their individual numbers legion.

THE MAMMALIA OF QUEENSLAND.

It is in this branch of natural history that the island continent, Australia, shows its most distinctive peculiarities. To everyone it is known as the land of the kangaroo, and to the student as the home of the marsupialia. Every immigrant, before his arrival even, has seen a picture of a kangaroo with the young one peeping out of the abdominal pouch, and so is interested in such a peculiar animal, but the student recognises that when in Queensland he is in the centre of as strange a group of animals as he could possibly find; a group which at one time existed over Europe, Asia, and America, but which now, with one or two exceptions, is only to be found in this island continent. A group of which the external marsupium or pouch is only one peculiarity; a group which has developed species analogous to the placental flesh-eaters, grass-eaters, and insect-eaters, and yet they are wholly different; a group which is as much at home upon the ground and in the burrow as it is upon the tree-tops or even in the air; a group which is an animal world of its own, showing in the species even now living, a distinct development through the monotremes from the reptiles. Fossil remains already discovered show that in the ages of long ago there were far more species than in existence, and some of these were of enormous size, taking the place of the gigantic ancient pachyderms of the old world, but still retaining the peculiar shape and anatomy of the marsupials. It is noteworthy that no fossil remains of large placental carnivora have been discovered such as would account for the disappearance of so many species. The settler in Queensland need fear no lions, tigers, bears, or wolves, for no animal exists larger than the dingo or wild dog, that can do harm to his flocks and herds. In Tasmania there are two specimens of carnivorous marsupials, which for ferocity and strength equal any animal of their size among the placentals, but they do not exist in this colony at the present day. There are, however, flesh-eating marsupials which can and do make considerable havoc among the poultry yards of the country settler; these animals, commonly called "native cats," take the place and somewhat the shape of the weasel or stoat of the old world. Other animals of the tribe of phalangers commonly called "opossums," are often very destructive to the gardens and orchards; but the greatest damage has been done to the farming and grazing industry by the many various species of the macropodidæ or kangaroo tribe. Australia in general, and Queensland in particular, offers an anomaly in the progress of settlement by mankind of uncivilised countries, insomuch that the wild herbivorous animals have largely increased since the advent of the European race and not decreased. Especially has this been the case with the kangaroo tribe, for evidently

the destruction of the dingo, and of the eagles by the settlers, and the decrease of the aboriginal natives destroyed the balance of nature so much that many parts of this colony became overrun with these grass-eating marsupials. They were as a plague in the land, to be seen by hundreds and thousands, eating out the grass which otherwise could support the more useful but less interesting sheep and cattle, therefore legislative interference was called for, and a bonus per scalp given for their destruction. Since the passing of this Act, only five years ago, no less than 6,000,000 scalps have been paid for. But this legislative Act alone would not have annihilated the plague, nature even stepped in with her aid, for the animals increased to such numbers they caused their mutual destruction, insomuch that they completely devoured every blade of grass in districts as large even as the whole area of England; then drought supervening their destruction was completed. Thus it is that districts which were overrun and useless are now again restored to abundance of grass and to occupation by domestic herds.

The only animals natural to Australia that are not marsupials are the wild dog, or dingo, as he is popularly called, the rodents, or rat-tribe, and the bats, of which the flying fox, a large fruit-eating species, is the best known.

The young of the marsupials are all born in the usual way, but in a very immature state, that of the great kangaroo being not over one inch in length. They never have any placental connection with their dam. Immediately upon birth they are transferred to the pouch, and in a mysterious way the apparently minute lump of flesh, which has no power of voluntary movement, is attached to the teat, from which the little creature is never separated until fully developed. The above is a scientific fact demonstrable by any anatomist. Nevertheless bush residents unacquainted with anatomy strictly affirm that the young one is born on the nipple. The larger kangaroos have only one young at a time, but some of the smaller genera sometimes have two in the pouch, generally differing in ages.

THE MACROPODIDÆ OR KANGAROOS.

Ever since the sailors of the veteran navigator, Captain Cook, announced to him that they had seen "the devil," in the shape of an animal as tall as a man, and that stood upright and hopped away on its hind legs only, has the kangaroo been associated in the popular mind with Australia, so without reference to scientific classification I pander to the popular fancy, and place the well-known animal first in the list for description. Necessity for curtailing space compels me to give but a brief account of the different families of our fauna, mentioning only by name one or two of the best known or peculiar species typical of the family, and leaving entirely alone that most interesting branch of natural history—the development of one species into another. A study which if pursued among the marsupialia and in conjunction with fossil discoveries of recent date will repay any amount of trouble, for it is a marvellous book of wondrous surprises.

THE GREAT KANGAROOS (genus *Macropus*)

of Queensland number about four species. In height they range from four feet to six feet, and in weight from 100lbs. up to 200lbs, the males being always larger, heavier and more powerful than the females. Their peculiarity is the great development of the posterior parts of the body and of the tail as compared with the anterior parts. Except when lying down, the kangaroo rests with its entire weight upon the hinder legs and the tail; when feeding the fore feet are put to the ground, and while the body is supported by them and the tail, the hinder legs are pushed forward both at once; when alarmed the animal raises the anterior portion of its body to its full height, and when frightened it leans forward and hops away by taking tremendous jumps, thus bounding over grass, logs, fences, or obstructions. In thus jumping, the weight of the animal comes solely upon the two elastic and strong tarsi of the hind feet, the tail never touching the ground, but merely by its weight balancing the creature in its rapid flight. The idea that the kangaroos use their tail to help them when jumping, or as a weapon of offence or defence is entirely erroneous. The anterior parts of the kangaroos when seen above the long grass as the animal, by his keen hearing becomes aware of an intruder, appear very graceful and deer-like, but this grace is dispelled as soon as movement takes place, for, except when flying rapidly before the pursuing dog, the movements of the greater kangaroos are decidedly ungainly. They are gregarious in their nature, and are frequently seen in flocks of from a dozen to one hundred; but in districts where they are not much hunted, the writer's observations are that they prefer to keep in groups of from six to a dozen, and in such a party, although the sexes will be equally divided, there will be one large and powerful male, termed by the colonists an "old man." He is the master, and will fight long and desperately with any rival who chooses to challenge him. When the family is disturbed, this "old man" will always be the last to move.

The kangaroo is perfectly peaceable and harmless to every living creature, but when hunted by dogs, after fleeing as far as it can go, it then turns at bay, and with its back against a tree, or standing up to its middle in water, it will fight to the last gasp. Its powers of defence are very great, for with its fore arms and feet, which though apparently small, yet are very muscular, it can catch up a dog and run away with it, or will hold it under the water until it is drowned; or with a stroke from one of its powerful hind feet, armed as they are with a long strong protruding claw, it will rip the dog completely open. It will also, when at bay, not hesitate to attack any man, even when on horseback. The extraordinary rapid increase in their number necessitated the settlers to combine and assist each other in the work of clearing them from the stock runs. Therefore, driving parties were systematically organised, and by the extensive erection of high fencing, with large strongly-fenced yards at the end, thousands of these animals were, by skill and care, driven in and slaughtered. The writer was at one such hunt when no less than 3200 grown animals

were yarded and slaughtered in the one day. This fact is stated just to show that it is only through the animals having increased to excessive numbers that this apparently wanton slaughter is undertaken. The peculiar formation of the lower incisor teeth of all the macropodidæ is such that they can hold their own in the struggle for existence against any domestic animal. These teeth are but two in number, as opposed to six in the upper jaw, but their peculiar conformation is such that not only can they graze as can other animals, but the two lower teeth, which are long and curved, can be opened and closed scissors-like, and thus the shortest and choicest grasses and herbs be cut off and eaten.

The flesh of the kangaroo is sometimes eaten, and from the tail is made an excellent soup.

On the fore feet of the macropodidæ there are always five well-developed toes, each of which is armed with a large and strong nail, curved; the two outer toes are the shortest and the central one the longest. The hind feet are furnished with one very large central toe, and an outer one, which is shorter and smaller, but like the first, armed with a large solid nail slightly curved. On the inner side of the foot are two small slender toes, united in one common integument, and having the appearance of a single toe; the nails, however, are separate, of very small size and hollow beneath. The use of these small nails is to cleanse the fur from vermin, such as ticks, which abound in the grassy and scrubby country. The tarsus underneath is hairless, but is covered with minute hardened tubercles, which are most distinctly developed and hardened in those species whose habitat is among rocky land. In color the great kangaroos are generally grayish-brown, but one species peculiar to the interior plains is of a decided red hue, more particularly so in the males. This species (*Macropus rufus*) attains to the largest size of any.

A peculiarity in the habit of all the kangaroo family which deserves mention, as it to a great extent accounts for the rapid increase of the animals when their natural enemies the dingo and the eagles were extirpated, is that when hard pressed by any pursuer the doe will eject the helpless young one from its pouch. Thus lightened, she is better able to escape from her pursuer, and the dog or eagle in pursuit immediately seizes the young one, and satisfies his appetite on it. A doe kangaroo unencumbered by young is very fleet, and is seldom caught by the native dog, who in most cases ceases to follow when he finds no young is ejected.

THE BRUSH KANGAROOS OR WALLABIES (genus *Halmatur*).

The immigrant will not have been long in the country districts of the colony before he will have seen numbers of what appear to be small kangaroos; he will have observed them suddenly hopping out from a tussock of long grass, or from under some bushy shrub, or, perhaps, feeding in hundreds by the side of a patch of dense scrub, just about the time of sunset. These all come under the designation of wallabies, brush kangaroos, and pademelons. There are about a score of species of them, varying in size from 10lbs. in weight up to 50lbs.

They are identical in shape with the great kangaroos, but are decidedly more agile and graceful in their movement, more fleet of foot, and more beautiful in their fur. Their colour ranges from a silver-gray to reddish-brown, and even black; often the underparts are white, sometimes yellow, and they nearly all have a bridle mark along the shoulder, and a horizontal stripe across the haunch. Distinguishing the species is difficult, for the colouring of the fur is not constant. In captivity (according to Kreft) they interbreed freely. Like the larger kangaroos, these smaller sized species increased to such numbers that they became a veritable plague, and even now require constant and stringent measures to keep them in check. To the settlers' crops they are very destructive; indeed, it is only by fencing in the cultivated ground with wire netting or close fencing, that a crop can be grown in districts where they are numerous.

THE ROCK WALLABIES (genus *Petrogalea*).

This genus differs from other wallabies in their possessing a long pliable tail, which is not thickened at the base, and the apical half of which is generally very bushy. They weigh up to 30lbs., and some of the species are very beautiful in the colouring and softness of the fur. As inferred from their name, they are partial to rocky country, and, notwithstanding their jumping system of locomotion, they are as sure-footed and active among rocks as any goat. Indeed, their agility is wonderful, and the almost vertical leaps they will take are quite astonishing. The long tail is not used so much as a support as in the other larger species, but by its pliability is admirably adapted for balancing the animal in its erratic movements.

THE TREE KANGAROOS (genus *Dendrolagus*).

This genus shows a curious variation of the typical habits of the family. Their fore limbs are more powerfully formed than in any other genus, and this peculiarity enables them to climb trees easily. There are four species found in New Guinea, and two that are inhabitants of Queensland. Their weight is said to reach up to 30lb. Very little is known of the animals or their habits, as they are very rarely seen, for they are residents of the dense scrubs and rough mountain country in the tropics. The fore feet are formed somewhat after the shape of the sloth, and the hind feet also have a grasping power. The tail is long and thin like the *Halmaturi*.

THE NAIL-TAIL KANGAROOS (genus *Onychogalea*).

These comprise two or three species of small animals that inhabit the interior plains. They seldom weigh over 10lbs. Their peculiarity is that the tail terminates in a bare nail-like tip, and also that their fur, which is of a light gray color, is of a soft, silky nature.

THE HARE KANGAROOS (genus *Lagorchestes*).

These are very similar to the preceding animals both in habit and peculiarities. In appearance and size they very much resemble the common hare, and they are the fleetest of the whole group of macro-

podidæ. In running they press the fore legs close to the side so that they cannot be seen, and they will make clear jumps of eight and ten feet high. The hind legs are very long and slender, and the tail rather short and stiff, but not thickened at the base. One great peculiarity of these two last genera is that in them the canine teeth are observable for the first time among the family of macropods.

THE BETTONGS, OR JERBOA KANGAROOS (genus *Bettongia*).

These are small animals for the kangaroo family, for they are only about the size of a rabbit. They also are similar to the rabbit in their habit of forming extensive burrows and living in communities. They are essentially inhabitants of the dry interior, and though four or five species are known, only one or two are to be found in Queensland. This group connects the kangaroo tribe with the Phalangiers or opossums.

THE RAT KANGAROOS (genus *Hypsiprymnus*).

This genus completes the list of kangaroo tribe. There are several species of them, and they differ but little from the preceding genus. Their size is the smallest of the tribe, running probably from 3lbs. to 6lbs. in weight. Their limbs are of more equal length, they progress rather slowly, and the tail is short and stiff. In the Bettongs the tail is more or less prehensile. Through the *Hypsiprymni* the kangaroos approach the bandicoot tribe or *peramelidæ*.

THE PHALANGISTIDÆ (PHALANGERS.)

This family of the Marsupialia is one that will be constantly coming under the observation of the immigrant to this colony. It comprises the native bear, the opossums, and the flying squirrels. These animals are all arboreal, and nocturnal in their habits. They are peaceable in disposition, but when wounded the opossums will bite severely. They have increased greatly in numbers (excepting the Koala, or native bear), and in many places in the Southern colonies the opossums have proved very destructive to farm and orchard crops.

There is no animal that the immigrant will be so certain to make the acquaintance of than the opossum. He is to be found every where that there are gum trees, from Tasmania to Cape York, in the interior or on the coast, although he is not so numerous in the interior country. His proper name is

THE VULPINE PHALANGER (*Phalangista vulpina*),

but every one calls him "opossum." There are several species of these animals, but they differ only slightly from each other and all are dubbed "'possums" by the colonists. Queensland possesses a greater number of species than any of the other colonies. In habit they are all nocturnal; during the day time they sleep in the hollow holes of old gum trees and so cannot be seen, but at sundown they pop out of their concealment and at once make for the extreme twigs of the tall trees, where they feed upon the gum leaves. Upon moonlight nights they are shot in great numbers by the younger members of the settlers' families. They do not show much intelligence when being hunted

for no matter what noise is made they seldom attempt to move from the branch they are on, or to take advantage of any sheltering hole. So muscular are they that when shot from the top of a tree even 90 feet high, if only slightly wounded, the fall has not the slightest effect upon them, and they will immediately run and ascend again. They can and will bite severely when wounded if carelessly taken hold of. The tail is strongly prehensile, and it is as easy for the animals to hang by it when curled round a branch as it is for others to hold on by their feet. In size the common opossum is about that of a domestic cat, but some of the Queensland species are rather smaller. In colour the vulpine opossum is an ashy grey, but the underparts of the body are yellowish, and old males have a rusty-coloured neck and breast; the fur is long and woolly; the tail is long, bushy with black hair, strongly prehensile, and it is naked underneath. The female has a pouch similar to the kangaroo; there are four teats in it, but she seldom has more than one or two young at a time. Their food is varied, but it is principally leaves, grass, and fruit; still, in confinement, the common opossum will readily eat meat, small birds, bread, and drink milk greedily. One that the writer once kept as a pet would not refuse beer when offered to it. The peculiarity of the phalanger tribe is that the hind feet have an opposable prehensile nailless thumb, and four toes, the two inner ones being small and united by a membrane. The fore feet have the usual five strongly-clawed toes. The incisor teeth still show the same peculiarity of the macropodidæ in being six above as opposed to only two in the lower jaw; the canines are always present. These animals are the principal food of the aboriginal native, who shows great skill in detecting by the claw-scratches on the bark whether the animal is asleep in the hollows of the tree. If so, then by a method of cutting notches with a stone tomahawk in the bark of the tree, alternating from side to side but distant each one about two feet higher than the other, the aboriginal will scale the straightest and biggest gum tree by using these notches for the purpose of placing his big toe in them. They thus act as steps, and rapidly and surely the black climbs the tree. He then cuts a hole with his tomahawk just over the part of the branch where the opossum is sleeping, pulls it out by the tail and stunning it against the branch throws it to the ground. The opossum is but seldom eaten by the settler as its strong eucalyptus flavour is not pleasant to a European palate.

THE CUSCOS, RINGTAILS (genus *Cuscos*, &c.)

Besides the few species of the phalangers commonly called opossums there is a genus peculiar to tropical Australia which differs somewhat from the typical phalanger. This is called *Cuscos*. The tail has only the basal portion covered with hair; the ears are short and almost hidden by the fur of the head; the eyes with a vertical pupil. In size they are about the same as the common phalanger and their habits are identical. There are several species of them, some having only recently been discovered in the northern scrubs. Then there are also the Ring-tailed opossums (*P. Cookii*, *p. viverrina*, and others), the

first mentioned being the very first phalanger ever discovered in Australia. In size these ring-tails are smaller than the ordinary opossum and more like the cuscus in appearance. They get their popular name from the white or sometimes reddish tip to their long, thin, and extremely prehensile tail, which is always more or less curved like a ring.

THE FLYING PHALANGERS.

These comprise three genera—*Petaurista*, *Belideus*, *Dactylopsia*. By the colonists they are all called “flying squirrels,” but they are true phalangers, so flying opossum would be nearer the truth, for the squirrel proper is not indigenous to the country. These animals have a membrane extending from limb to limb, and they have a long bushy tail; their fur is long, loose, and soft. They do not fly, but, climbing to the top of a tree, they will then jump off, and spreading out their legs to the utmost, the membrane thus acts as a parachute and they descend in a graceful incline towards the ground; but with the momentum of their descent they can, if desired, ascend to a considerable height again, just as a boy's kite ascends against the wind. They will thus make a “flight” of from fifty to one hundred yards, according to the height of their starting point; generally they alight upon the naked bole of a tree in a line with the one they started from, for they have no power of flapping their “wings” as do the bats, but they have considerable control over the direction of their flight and thus are enabled to avoid the limbs and branches in their way. After alighting upon the trunk of a tree they rapidly ascend to the top, and again jumping off are away to another one before the observer has time to follow their agile movements. They are strictly nocturnal and live on similar food to the opossums.

The Great Flying Phalanger, the largest of the species, measures 20 inches from the tip of the nose to the root of the tail and this tail is itself often 22 inches long. The other various species range in size downwards to a length of 6 inches of body with a tail of 9 inches. The whole of the species are beautiful creatures, graceful in all their movements and at night time the personification of activity. They are fairly numerous in some districts but are only seldom seen by the general colonist on account of their nocturnal habits and rapid movements.

One species is a marvellous little miniature, being only the size of a common mouse. It is called the *Acrobates Pygmæa*, or “flying mouse.” It differs from the larger species in the tail being “feathered” with a web of hair on each side. It is seldom obtained unless discovered asleep in the day time by some wood-splitter when felling a tree.

Space will not permit of more than the mere mention of the genus of small rat-like phalangers called *Dromicia* and the genus *Tarsipes*, the latter of which is not found in Queensland, but is interesting as it is acknowledged to be one of the links connecting the marsupialia with the monotremata.

THE KOALA, OR NATIVE BEAR (*Phascolarctos Cinereus*).

The immigrant will not have been long in the wooded country of the Queensland mountain and coast districts before he makes

the acquaintance of this the most harmless, the meekest of marsupials. Though called "Native Bear," it has not the remotest connection with the bear tribe of animals, for it is a marsupial and allied to the phalangers. Like the opossums, its habits are strictly nocturnal and arboreal. In size it is larger than the opossum, for its total length is about two feet, and its general appearance is round and plump. It will weigh, if full grown, over 28lbs., and it is such a mass of muscle that a fall of 100 feet does not disconcert it in the least. In this animal is seen a strange exception from the long and strong tails which are such a common feature of the marsupialia, for the koala has no external tail although in the skeleton are to be found several flattened caudal vertibræ. In colour the animals are an ashy-grey, which renders them very inconspicuous against the grey bark of a gum tree when coiled up during their diurnal sleep. Unlike the opossums they do not seek the shelter of hollow spouts in the large trees but choosing some fork to sit in, they tuck their head into their breast and thus sleep out the day without the slightest protection from external foes. The koala is a powerful climber and seldom troubles the ground except when wishing to change from tree to tree; its food is almost entirely the leaves of the eucalyptus and other trees. The female has one young at a time, which, after it gets of an age to leave the pouch, is carried upon the back of the mother. Even when wounded the koala seldom attempts to bite.

THE DASYURIDÆ OR CARNIVOROUS MARSUPIALS.

Those two large flesh-eating marsupials, the Dog-headed Thylacine (*Thylacinus cynocephalus*), and the Tasmanian "devil" (*Sarcophilus ursinus*) not being found in the colony of Queensland, it is sufficient in this paper to say that they are the most ferocious and strong of all Australian animals, not excepting even the Dingo. This ferocity and the slaughter they inflicted upon the shepherd's flock earned for them the soubriquets of "hyæna," "tiger" and "devil." There are, however, several species of the different genera of the family *Dasyuridæ*, which are common in this colony, and which are popularly known by the name of "native cats." In appearance they have not the slightest resemblance to the domestic cat, but have more the shape of the ferret. The genus most commonly known is that of *Dasyurus*. The length of the body varies, but about 12 inches is the average, and the tail will average 9 inches; the fur is yellowish in colour with spots of white over the back and sides, and the underparts are white. There is a variety in which a jet black takes the place of the yellow, and there is another variety which attains to a much larger size than above mentioned, and yet all these are classed as the same species. The *dasyuri* are ferocious little creatures, and at times commit sad havoc among the poultry flocks of the settler. They are easily trapped, but will fight valiantly when escape is impossible. They are nocturnal in their habits. The female has from four to six young at one birth, and possesses a shallow pouch; the young are firmly attached to the nipple as in the kangaroos.

Another genus which will very likely cross the path of the settler is that of *Phascogale*. These animals are about the size of a rat; they are of a blueish-gray colour, and the underparts white, and the most common species can be distinguished by the bushy tip to the tail, hence its name *P. penicillata*. All these species are nocturnal and arboreal in their habits, but unlike the *Dasyuri* they do no havoc to the poultry, their food being smaller creatures, such as young birds, &c. The writer has found this little animal in all parts of Australia, from Cape York in the north to Cape Otway in the south. The female has no pouch, yet it is a marsupial.

There is a genus of this family called *Myrmecobius*, which, although not as yet having been found in this colony, deserves mention here, because the species composing it are regarded as one of the links in the chain of development of the marsupialia from the Ecidnæ or Monotreme ant-eaters. The teeth (52 altogether) of the myrmecobius are small, weak, do not touch each other, and in number are not exceeded by any living mammal. It is not unlikely that further research will show this interesting little animal to be an inhabitant of the interior western plains of this colony.

THE PERAMELIDÆ OR BANDICOOTS.

There are several genera and at least a dozen species of these pretty little marsupials found in Australia, and Queensland has her fair share. Space compels me to group them all under the common head of bandicoot. The settler is certain to become acquainted with them, for they make far too free with the sweet potatoes and other crops. In size they vary from that of a rat to that of a rabbit. They can be recognised at once by their elongated muzzle, short tail, and burrowing habits. The fur is harsh, but with an under fur very soft; their fore feet are short and weak; in appearance the bandicoot proper (*perameles*) is not unlike a miniature pig. Their food consists of roots, grasses, insects, and small animals. The pouch in the female has the opening the reverse way to that found in the kangaroos; the number of the young is four, although there are eight mammæ. These little creatures are very tame, frequently coming into the huts at night time and picking up the crumbs on the floor notwithstanding the presence of persons.

THE MONOTREMATA.

No essay upon the mammalia of this colony would be complete without mentioning the two wonderful animals which comprise this sub-section of the Marsupialia. The one is called by the colonists the "porcupine," and the other the "duck-bill."

THE SPINY ANT-EATER OR *ECHIDNA HYSTRIX*.

This strictly Australian animal is common in Queensland. In size it is about 18 inches in length, of stout, low build, and in appearance somewhat like the hedgehog of England. The upper parts are covered with strong spines, which are the natural defensive armour of the animal; an armour indeed quite impregnable to all enemies

other than man, for, like the hedgehog, it has the habit of rolling itself up into a ball when danger threatens; the strong spines then protrude in all directions, and the animal remains thus rolled up until the danger has disappeared. The face of the animal is prolonged into a long sloping thin snout with a very small mouth-opening at the end, and the tongue is long and flexible. Its food is supposed to be ants and insects. It has no teeth, but some horny excrescences on the palate behind. This interesting creature is amazingly strong, and can burrow with extreme rapidity, indeed, it has the most extraordinary faculty of sinking out of sight of the observer, provided the ground be loose or sandy. The male has a spur on the heel of the hind foot, this spur is perforated and supplied with a secretion from a special gland, but for what object is not known; as there is no case on record of injury from this spur it cannot be called poisonous. The female possesses two small rudimentary pouches, in each of which a minute young one has been observed; she has, however, no mammæ, but the milk exudes into the pouch. Through the Echidna the marsupials are linked to the reptiles, and in many anatomical respects these animals are one of the curiosities of nature in this southern world.

THE PLATYPUS OR DUCK-BILL (*Ornithorhynchus*.)

Curious as is the Echidna yet its interest pales before that of its congener, the platypus, or water-mole. This is without doubt the most interesting of all the many interesting animals peculiar to Australia. It is one of the wonderful links which nature now and again presents, showing how one form of life can develop into another. The platypus is the lowest living form yet discovered of the mammalia, and through it the marsupials are connected with the reptiles. The anatomical peculiarities of these pretty little water-loving creatures are so great that they excited surprise and almost doubt as to their reality when first presented to the naturalists of Europe. The *ornithorhynchus* is common in many parts of Queensland; being amphibious it is never found away from the river banks, where, during the day time, it sleeps in burrows. In appearance it is not unlike a large mole, for it has the same dense fur and rounded, sleek contour. But in size it is very much larger than the mole, adult males being found 24 inches in length including the tail, which is about 5 inches long, broad, and beaver-shaped. The body is broad, flat, and reptile-like; it is carried close to the ground, for the legs are short, but provided with five strong toes, which are webbed in such a manner on the fore feet that the webs protrude when swimming beyond the powerful claws and form perfect paddles. On the heel of the hind foot of the male is a spur and gland, but whether poisonous or no has not been satisfactorily decided. The head of this curious animal terminates in a beak like a duck's—hence the name. The only teeth this animal possesses are four horn-like molars situated far back in the head. The eyes are very small, black, and bright, and there is no external ear to be seen, but examination of the head shows the natural orifice which the animal has the power of opening

or closing at will. These little creatures are perfectly harmless, they can be seen about sunset swimming and diving in the still lagoons of some water course. Their food consists of vegetable matter, insects, small mollusca, and the ova of frogs and fishes, for the obtaining of which their peculiar mandible is admirably adapted. Until lately nothing was known of the manner of bringing forth their young, but the researches of Mr. Caldwell, a young British scientist, who visited Australia expressly to study the habits of the Monotremata, discovered that this curious mammal is rendered still more curious by the fact that the female lays eggs, which are afterwards hatched, and the young nourished by the milk of the mother exuded from mammary glands, although no teats are observable.

THE PLACENTAL MAMMALS.

THE DINGO.

Having completed the mention of all the different families of marsupials found in Queensland, I must give some notice of the non-marsupial or placental mammalia or this paper will not be complete. There are so few of them that the chapter will not be a long one. The one deserving most notice is the Dingo or native dog (*canis dingo*). Owing to the discovery of fossil remains of dogs having been discovered in Australia it is now an accepted fact that this animal is indigenous and has not been introduced, as many have supposed. The dingo is essentially a dog, and the settler will recognise it the first time he sees one. In colour it generally is of a yellowish-red, or reddish brown, but sometimes it is black, with tan underparts. Though varying in colour yet they are all of the one species and all are alike in appearance, having a bushy fox-like tail and a wolf-like head, and in size they are equal to that of a large shepherd's-dog. They are very strong, agile, and fleet, and possess also a large share of fox-like cunning; they also know and sometimes practice the wolf-like habit of hunting in companies, though these companies seldom exceed six or eight in number. They are very destructive to the sheep and calves of the settlers, but strychnine has now exterminated them from districts where they were once numerous. The fact is the dingo and civilization cannot coalesce and the dog is doomed. In many parts of Queensland they are still very numerous, and their mournful howl at night time and particularly during the winter months can frequently be heard even within a few miles of Brisbane. The dingo breeds freely with any of the domestic dogs.

THE RODENTS.

The family of rodents, or rats, are the only animals, other than the dingo, that belong to the placental mammals of Australia, excepting of course those aerial mammals, the bats, and the sea animals, the seals, dugongs, and porpoises. There are three genera and many species. In size they vary from that of a common mouse to that of a large rat. At times, some of the species increase to very great numbers in a most unaccountable way until they become like a plague in the districts of the interior plains, and these myriad hosts will just as quickly dis-

appear. There is one genera which jump on their hind legs like the kangaroos, and there is another which build curious nests of twigs in the bushes; some live in burrows or cracks in the ground, and some in the hollows of trees, but the most curious and beautiful of the whole tribe is the Beaver-Rat (*Hydromys*). These animals are peculiarly Australian, as much so as the kangaroo. They are amphibious in their habits, and are found almost in every water-hole or creek. They dive well and are admirably constructed for an aquatic life. Their food consists of moluscs, fish, and water insects, and they are very partial to cream, according to the observations of the writer, whose dairy used to be regularly visited by these animals living in a neighbouring lagoon. The fur is beautifully dense, of a brown or black colour on the back and head, but of a golden yellow or else white on the underparts, and the tail is always tipped with white or yellow. They live in burrows in the banks of the river, and the female produces four young at a litter. They, like many others of the rat species, are frequently the prey of snakes.

THE KALONG, OR "FLYING FOX" (*Pteropus Poliocephalus*.)

There are about two dozen species of bats found in Australia, five or six of which are Fruit Bats, commonly called "Flying Foxes," probably on account of their rusty colour and somewhat fox-like head. The species most commonly seen is about the size of a large squirrel in the body, but the wings are enormous in proportion, for the common measurement from tip to tip is four feet. These animals are the most formidable pest that the orchard-owner in Queensland has to encounter. They sally out at sunset from their camps or roosting-places in countless numbers. A constant stream of them can be noted, all flying in one direction, until some orchard is espied, when they dive down, and, in a very short time, commit frightful havoc among the ripened fruits. Shooting has no effect upon the crowd, for, though scores may be killed, yet hundreds and hundreds take their place. No certain way of warding them off has yet been discovered, but of late years the plan of burning sulphur has been found to check them. During the day time they congregate in "camps" of thousands, hanging from the topmost twigs of the loftiest trees in clusters: they thus sleep out the day, head downwards. When one of these haunts is discovered they can be shot in hundreds, for they are loth to take wing during day-light. In the woods they live on the wild figs and other fruits, the flowers of the bloodwood, gum-tree, and ti-tree. They also are fond of honey, and probably devour insects as well. Although they are sometimes called Vampires, they are perfectly harmless to all animal life. Moreover, during the season of the year that they are living upon honey-bearing flowers, they are by no means bad eating when better food cannot be got. Their flight is noiseless and with measured beat, but they can keep this up for many miles, for it is no uncommon thing for them to visit orchards nightly which are ten to twenty miles from their known camps. While feeding, they are constantly quarrelling and screeching, and flying from

tree to tree. I am not aware that there is any creature that preys upon them, hence their great numbers, notwithstanding that the female has only one young at a birth.

ORNITHOLOGY.

The number of known species of birds common to Australia is fully 700, and of these in all probability 600 are to be found in the colony of Queensland. This land of the marsupials is as rich in curious and anomalous species of birds as it is in animals. There are birds varying in size from the minute wrens to the gigantic emu and cassowary; in colour, there are families that can vie with the gorgeous trogons and parrots of the Indies; in beauty, with the humming birds, and some show peculiarities of construction and habit found among the birds of no other country on earth. The merest sketch of a few of the principal families will be all that space will allow in this essay. For further information the student must turn to Gould's magnificent book upon the *Birds of Australia*.

RAPTORES.

The large and powerful birds of this order are not to be found in Australia—that is, there are no vultures, condors, or large eagles. Doubtless the absence of the larger herbivorous animals has something to do with this. However, there are eagles, ospreys, falcons, kites, and harriers, in great numbers. The WEDGE-TAILED EAGLE (*aquila audax*) is the common eagle-hawk of the colonies. It is the noblest of our raptores; is universally distributed over the whole of Australia, and is common upon the sheep farms of the interior plains, where at times it causes much loss among the lambs. In courage it does not come up to the golden eagle of the northern hemisphere, for although it will and does pursue and kill the smaller species of kangaroo, yet it prefers the more easily obtained carcass of the already dead sheep or bullock, and the defenceless lamb. It also chases the doe kangaroo until she ejects her young one from the pouch, which the bird then immediately seizes. In size this eagle will measure between six and seven feet from tip to tip of the wing. The talons are very powerful, and never relax their hold when once a grip is taken. In colour the birds vary from a light brown to a very dark brown, almost black. They build gigantic nests in the fork of some large gum tree or some solitary tree of an extensive plain.

The WHITE-BELLIED SEA-EAGLE (*polioætus leucogaster*) takes the place upon the sea shores and bays that the wedge-tail does on the land, but it has not the same pluck and courage. A smaller eagle very common about the bays of Queensland is the White-breasted Sea-eagle (*haliastur leucosternus*.) The immigrant will recognise it as soon as the ship enters the port, by the snow-white breast and head, contrasting with the rich chestnut-red of the upper parts and wings.

The FALCONS (genus *Falco*) are represented in this colony by the Black and the Brown, and the Black-cheeked Falcons. Of these, the former (*falco subniger*) is the largest, strongest, and most daring, and

its powers of flight are very great. It and the brown falcons are the constant attendants upon the drovers of the large herds of cattle which traverse the continent. The advancing cattle cause the quails to rise and fly, and these are then pounced upon by the falcons and kites which are circling around and in front. The KITES (*milvus*) are the commonest birds of prey in Queensland. They are to be seen in flocks of hundreds about every settler's homestead, where they perch upon the rails of the stockyards in the hopes of picking up offal from the slaughtering of cattle, &c. They are very bold, showing absolutely no fear of man. They fortunately seldom steal the poultry, preferring more easily obtained food such as offal or grasshoppers.

There are several species of Hawks, Goshawks, Harriers, etc., and a beautiful little Kestrel of a Nankeen colour; this bird exhibits the same peculiarity of "hovering" as does the European species. Many of these hawks are very active and pertinacious in their attack upon the poultry flocks of the settlers.

The night birds of prey have some fine noble species among them. The OWLS number some half-a-dozen or more species. In some districts they are common, but, being night birds, they are not so often seen, and many people even do not know that they exist in the colony. The Great Owl (*hieracoglaux Strenuus*) measures no less than 24 inches in length; it frequents the scrubs of the coast districts, sleeping during the day in some dense scrubby tree; it is a swift flyer, is powerful, and, at night its loud sonorous note can be heard for a great distance.

The Boobook Owl (*spiloglaux Boobook*) is much smaller, and it is more commonly seen than any of the family. The peculiarity of the bird is its cry of "Buck-buck," "Buck-buck;" this can often be heard at night, and upon a still evening even for over the distance of a mile. It sounds so exactly like the English cuckoo's note, that the immigrant upon hearing it for the first time, at once puts it down as that bird, and he is astonished to hear it at night time.

INSESSORES.

This order of birds is represented in Queensland by numerous species of numerous families, and they comprise some forms peculiar to the country. A glance at a few of the more prominent will be all that can be undertaken in this paper.

The settler will not have been long established in his new home in the bush, before he makes the acquaintance of some species of the family CAPRIMULGIDÆ or Night-jars, the vulgar name for which is "goat-sucker." These birds are nocturnal in their habits, they are clothed with a peculiar moth-like plumage, and are noiseless in their flight. Their peculiarity is the mouth, the enormous gape of which astonishes the settler who sees it for the first time. At night, these birds force themselves into notice by reason of their rather mournful, but loud cry of "more-pork," "more-pork," slowly but frequently repeated, and which, like the "buck-buck" of the owl, is one of the voices of the night time in Australia. The bird is invariably called "more-pork" by the colonist. There are several species of them,

some being very small; all have the same moth-like plumage and soft sailing flight.

The SWIFTS and the SWALLOWS have numerous representatives in Queensland. One species of swift is almost identical with the European species, but the other is a noble bird, the largest of the swifts of the world, and the grandest flyer on the face of the earth. It is the Spine-tailed Swift (*chaetura caudacuta*). A native of India, it nests in the Himalaya Mountains, and migrates for a summer holiday to Australia. Its powers of flight are most marvellous, indeed unequalled for rapidity and for ability to turn, and it is never known to rest from flight until the shades of night drop around, when it dives down and enters into the hollow spout of some old eucalypt of the primeval forest.

There are several species of swallows in the colony and they have, since the advent of civilized man, adopted the social habits of their congeners in the old world, and nest under the verandahs and eaves of the houses, both in the towns and the country. Previously to houses being built, they constructed their mud nests in hollow trees, and in caves and under projecting rocks. One species, the Welcome Swallow (*hirundo frontalis*), is very like the English swallow, and is very commonly distributed. The Fairy Martin (*lagenoplastes ariel*) is another graceful swallow which crowds its long-necked, hemispherical, mud nests in scores under the verandahs.

THE BEE-EATER (*merops ornatus*) is very common in some parts of the colony, more particularly in sandy country. It is elegant in shape, graceful in flight, and beautiful in its green, blue, and orange plumage. It nests in holes in the sand, the entrance to which is approached by a tunnel, often two or three feet in length. It is very destructive in the neighbourhood of an apiary. It arrives in Queensland in the Spring time. Another bird which arrives about the same time as the Bee-Eater is the Dollar-bird, or Australian Roller (*eurystomus pacificus*). It is sure to force itself upon the settler's notice by reason of its green colour, its noisy chattering habit, and the peculiar white spot, about the size of a dollar, that appears in each wing as it flies. Hence its name. It nests in the holes of the gum-trees. It is useful by destroying the larger beetles and moths, &c.

The KINGFISHERS of this colony are individually very numerous, and there are several species of five or six distinct genera. The most noted of them is the "Laughing Jackass" (*dacelo gigas*), a bird which is one of the oddities of the Australias, and is now world-renowned for its peculiarities, and absurdly comical, gurgling, laughing note or song. The bird is very common, and there is not a homestead in the country that it does not visit, for it shows little fear of man, indeed it is one of those birds which takes kindly to the advent of civilized man, attending him while engaged in ploughing, or gardening, and always on the lookout for any lizard, young snake, mouse, or other vermin that shows itself. Then this stolid, ungainly bird flies down from its observing place on some neighbouring tree, nips up its prey, flies back again to the branch, and, after beating the victim to death, swallows

it whole, and gives vent to its satisfaction by pouring out its loud and hearty laugh. This laugh is the first sound the bushman hears in the morning, and the last at night. The bird is in consequence frequently called the settler's clock, is a universal favourite, and is seldom shot, except by the thoughtless boy. In colour it is brown, the head and beak are large, and as it ruffles the crest feathers frequently, this makes the head appear larger than it is, and still more ungainly. The nest is simply the decayed wood of a hollow spout of a gum tree, and the eggs are white. The other Kingfishers are all more or less blue in colour, like the Alcyon of Europe. One species that frequents the river's banks is very similar in appearance and habits to the English bird; but others, which are common about the homesteads do not trouble themselves about the water, but in their habits are similar to those of the Laughing Jackass. The names of the two most common species are the Sacred Kingfisher (*halcyon sanctus*), and the M'Leay Kingfisher (*cyanalcyon Macleayi*). The last named bird can easily be distinguished by reason of its white collar.

The ARTAMIDÆ or WOOD-SWALLOWS are a family of birds, the headquarters of which is in Australia. There are several species of them, and the immigrant will recognise them when he observes a group of birds, about the size of a starling, and of a brown or grey color, which from time to time fly from the branch they are perched upon, and sail in a swallow-like manner, until the insect that is being hunted is caught, when they return to the same branch. They are fearless of man, and frequently nest in trees near the homestead; like the bee-eater, they are fatal to bees, and will soon decimate an apiary.

The PARDALOTES are another family of birds peculiarly Australian. There are several species of them, all of small size, all very prettily marked with dots or spots of yellow or red or black. They all have a sweet plaintive note, which is incessantly uttered. They would escape the notice of any but the observant settler, if it were not for their habit of burrowing tunnels, three feet in length, in the sides of the wells and water-holes, at the end of which they excavate a chamber, and build a loosely formed nest. The common name for them is Diamond bird.

There are no true Shrikes in Australia, but there is a family of CROW-SHRIKES, some species of which are common in Queensland. The members of one genus are called Butcher-birds, and well they deserve the name, for they are bold and ruthless destroyers of small birds, their eggs and young; also, they hesitate not to fly under the verandah, and tear the canary from its cage; the long thin beak, with its powerful hook at the end, being admirably formed for this purpose. The bushmen give them the absurd name of "Van Dieman's Land jackass," presumably because of some slight resemblance they have to the laughing jackass. They have a musical melodious song, but of short duration.

The AUSTRALIAN MAGPIE is classed among these Crow-shrikes. This is a noble bird—handsome in its contrasting colors of black and white. Like the laughing jackass, it is a universal favorite, and it is

found about every farm in the southern and interior plains of the colony. Its powers of song eclipse those of any other Australian bird. During the nesting season its loud organ-like notes are constantly heard, and are indescribably sweet and liquid. The birds are easily tamed, and show equally as much cunning and sense as does the magpie of Europe. They learn to talk, and repeat the words clearly and distinctly. A tame one is generally to be seen hopping about every homestead in the bush. There are several species of them, and they are among the farmers' best friends, eating all kinds of insects destructive to the crops.

The MAGPIE-LARK (*grallina picata*) is another bird seen about every homestead, provided there is water in the neighbourhood. Its shrill whistling note is a common sound of the farm. The bird is about the size of, and not unlike, the English lapwing, and it will be easily recognised by this description, coupled with its pied black and white plumage. It builds a large nest of mud on some bare branch overhanging the water.

The family of FLYCATCHERS (*Muscicapidæ*) has many representatives in Australia, all of which are to be found in Queensland. Some of the species are very common both in the country and in the town suburbs. Following the aim of this essay, which is just to speak of such birds as are sure to be seen by the immigrant, or else are of such peculiarity as to demand special notice—

I must mention the BLACK FANTAIL (*sauloprocta motacilloides*). This bird is universally distributed over the whole of Australia. It is one of the most tame and familiar of birds, evincing not the slightest fear of man or animal. It is constantly in motion, skipping about the horses, the cattle, the sheep, and snapping up the flies that torment them. It flies on to the back, runs along, mounts on to the horns, snapping at the flies, and all the time incessantly opening and shutting its tail and its wings, and uttering its short cheerful chirping note. It is well named the "shepherd's companion," for it is his constant attendant, his cheerful little mate. Some of the species are triumphant architects, constructing closely-felted nests of elegant, wineglass-shaped form.

The ROBINS are by no means left behind when the immigrant sails from the "old country." Under the family name of *Saxicolidæ* there are nearly a score of species of many different colours, and yet they are all robins in appearance. Accustomed as the British farmer is to the sombre hue of the Redbreast, he will be astonished beyond measure the first time he sees perched upon the furrow slice he has just ploughed, the gorgeous scarlet, black and white robins of Australia. The contrast of these colours is so vivid that it excites involuntary surprise. The head and upper parts are black, with white on the wings, and a white tip on the forehead, and the whole of the breast is vivid geranium scarlet. They show all the boldness and familiarity of their European prototype, and in habits and manners are very similar, but they do not nest on the ground in banks; on the contrary they construct a beautifully neat, chaffinch-like nest in

the fork of a tree, or between the loose bark of the tree trunk. The scarlet-breasted species is only seen in the southern plains-land of Queensland. Its place is taken upon the farms of the scrub lands and of the river banks by the Yellow-breasted Robin, which, however, is a more retiring bird. Other species are the red-capped, the pied, the brown, the white eye-browed, &c.

The LYRE-BIRD (*menura*) is one of the curiosities of Australia, but unless the immigrant settles in the densely-wooded mountain districts of the southern part of Queensland, he is not likely ever to see it in a state of nature. The bird is about the size of a game fowl, but it is higher on the legs, which are especially formed for running; its colour is a dark-brown. Its peculiarity consists in the tail, which is identical in shape to that old fashioned musical instrument, the lyre. There are three species; the one that is found in Queensland being called Prince Albert's Lyre-bird, in distinction to one common to the Southern Australian Colonies which is called Queen Victoria's Lyre-bird, but the difference between it and the New South Wales bird is problematical. The birds are most wonderful vocalists, they are indeed the mocking bird of Australia, imitating accurately every sound of the bush.

The WRENS (*Maluri*) are numerous individually, and of many species. Unlike the sombre-coloured Jenny-wren of Europe the Queensland birds are marvellous little gems of beauty. They are excelled only by the finches in the lovely contrasting of their brilliant colouring. Among them is to be seen deep cerulian blue contrasted with jet velvety black; red with black; blue with white, and in others a blending of the whole of these colours. They go in families of six or eight, flitting about from bush to bush; every now and again the gorgeous-coloured male,—the father of the group,—mounts on to some topmost twig and utters his lively, shrill little song, as if anxious to draw attention to his beauty. The females and young males are invariably a sombre brown in colour. The whole of the species construct domed nests placed in tussocks of grass.

The FINCHES (*Fringillidæ*) of Australia number as many species as do the wrens, and individually, are far more numerous. The settler will come across many varieties. It is with regret that I shall have to curtail my writing concerning these lovely birds into a paragraph, for there are several genera, all showing distinct peculiarities and containing several species each, and yet they all are finches. All the species build large, loosely-constructed domed nests of grasses, and some of which have a spout-like entrance projecting from the top; all the eggs are white and barely distinguishable one species from another. In colour these birds show in some species the same contrasts of bright scarlet, against black, or brown, or white as do the robins; some, again, are beautifully spotted white on black and others with black on white; a fiery-red over the tail shows conspicuously in some species, and there is another which is wholly of a blood-crimson colour. Some are uniform olive-brown, and some brown and white; a

peculiarity of one genus is the curious masked markings of the face and head, and there is another genus called *poephilla*, or grass lovers, the several species of which are the most elegantly beautiful combination of colours outside of the butterfly world. Anything more lovely than the Gouldian Grass-finch it is not possible to find, even among the humming birds of the Indies. It is pleasing to think that the ornithologist, who has done so much to make the birds of Australia known to the world, has so beautiful a gem named after him. It is an everlasting monument to his genius. Unfortunately the bird is uncommon, being only found in a limited district of Queensland.

The family *Paradiseidæ* are represented in Australia by the world-renowned BOWER-BIRDS. There are four or five species of them, all to be found in Queensland. In size these birds are about that of a large missel thrush, but plumper in form. Some of the species are very beautiful, notably the Satin-bird (*ptilonorhyncus holosericeus*), the male of which has the whole of the plumage of a deep shining blue-black resembling satin, and the Regent-bird (*sericulus melinus*), the male of which has a gorgeous livery of golden yellow, and deep velvety black. Other species are fawn-coloured, with more or less iridescent mauve-like collars upon the back of the neck. The whole of the species are fruit-eaters, and at times very destructive to the gardens. The peculiarity of the family is their habit of constructing bowers of twigs and grasses, erected on end and arching over like a bower. This structure is about one to two feet in length by a breadth that enables the bird to run easily through it. Shells, bits of bones, feathers, stones, and anything gay-coloured or glittering are collected, and placed about the bowers as ornaments. These are not nests, but are used simply as courting grounds, and playing places. Each species makes its own peculiar shaped bower, some being longer and more elaborately decorated than others.

The CROW (*corvus Australis*) is to be found everywhere over the whole of Australia. Wherever there is a dead animal, large or small, whether in the forest, or on the plain, by the side of the sea shore, or in the far interior desert land, there is the crow. He is the universal scavenger and also destroys more bird's eggs than any other creature in the country. However, he is outwitted by the gigantic cuckoo (*Scythrops novæ hollandiæ*), which lays its eggs in the nest; thus the crow becomes foster parent to the young one.

The HONEY-EATERS (family *Meliphagidæ*) are the most special feature of Australian Ornithology, nevertheless, I shall have to curtail my description of them down to a single paragraph. The ornithologist Gould, in writing of this extensive family, says, "They are to the fauna of Australia, what the *Eucalypti*, *Banksiæ* and *Melaleucæ* are to the flora. The economy of these birds is so strictly adapted to those trees, that the one appears essential to the other; for what can be more plain than, that the brush-like tongue is especially formed for gathering the honey from the flower cups of the *Eucalypti*, or that their diminutive stomachs are especially formed for this kind of food, and the peculiar insects, which constitute a portion of it." There are

fully sixty species of these birds, and they comprise many of graceful form, and elegant plumage. In size they range from about four inches, including the tail, to about twelve inches. Amongst them are some sweet songsters, though of no great power. Others are incessantly chattering, so much so, as to have been named the "garrulous honey-eaters." Others again exhibit an air of comicality in their rich vocalism, apparently uttering such words as "four o'clock! four o'clock!" etc. Some species are of a sombre-brown, or olive-green, while others show yellow in all its brilliance. Yet, another has an intensity of scarlet over the whole of the head, neck, breast, back and upper-tail coverts. In Queensland there is allied to this family the Sun-bird (*nectarina Australis*) which, by nature of its form, and its long curved bill is the nearest approach to the humming bird that Australia possesses.

There are no wood-peckers in Australia, but their place is occupied by numerous TREE CREEPERS (*climacteres*) and the SITELLAS (*sitellæ*) which are frequently seen climbing the trunks of the trees, or clinging back downwards to the branches.

The CUCKOOS exist in Australia, but they are not regarded as the harbingers of spring as in the old world, neither is their song that of the familiar "cuckoo, cuckoo." There are several species of them, varying in colour from one similar to the European cuckoo, to that of deep glossy, greenish, blue-black, with scarlet eye. Others are of a beautiful metallic bronze colour, with the cuckoo-like bars on the breast and belly. The smallest of the family is the Bronze Cuckoo (*lamprococcyx minutillus*) which has a total length of five and a half inches, and the largest is the gigantic Channel-bill (*scythrops*) called by the colonists the "hornbill," and which, as before stated, is parasitic upon the White-eyed crow. A genus which is not parasitic is the *Centropus* or Pheasant-coucal. This bird is very common in Queensland, and is sure to be roused up from the grass by the settler on his farm. It is commonly called the "pheasant," on account of its pheasant-like appearance and long tail. It is a poor flyer, being very weak in wing development. The nest is placed in a tussock of grass, is composed of grass, and is sometimes domed over.

The family *Psittacidæ*, or PARROTS. No group of birds will so attract the eye of the immigrant, and cause him to realise that he is in a foreign and tropical country, as will the cockatoos and parrots. They are exceedingly numerous individually, and also as regards their varieties. To do justice to their peculiarities and their beauty, would require a volume, all that can be attempted here, is a glance at a few of the leading varieties, most commonly seen by the settler. There are several White Cockatoos, all of which congregate in flocks, and all of which, when caged, can be taught to speak with more or less fluency. The best known is the Sulphur-crested Cockatoo (*cacatua galerita*), which is a bird of large size and of pure snow-white plumage, excepting that on the head is a sulphur-coloured crest, which is constantly being raised and lowered. These birds exist in countless numbers in some localities, and are very destructive

to the newly sown cornfields of the farmer. Their wariness is so great that it is difficult to approach near enough to shoot them, when engaged in these pillaging expeditions. The Long-billed Cockatoo (*licmetis tenuirostris*), commonly called "corella," in undoubtedly the best "talker" of all the species. Its powers of vocalization are simply wonderful, and its intelligence is so great that after some years of domestication, it certainly is able to associate certain phrases with certain effects. The birds are not so common as the sulphur-crested, for they are peculiar to the interior plains. They have no crest; the long bill is a good distinguishing mark. Other cockatoos that are kept in cages are the Little Corella (*l. pastinator*), the Rose-breasted Cockatoo (*C. rosiecapilla*), which is of a grey colour on the upper surface, and rose-red on the head, breast, and under parts. There is one bird caged within a few feet of the writer, as he is penning this paper, and it is incessant in its efforts to attract the attention of the children by crying out "Who are you?" "Naughty boy, cockey," "No, cockey's pretty," etc., etc. Many of the different species of parrots and paroquets are also kept as pets, and some of which learn to talk well, but in a whistling tone of voice.

There could not possibly be a greater contrast to the white cockatoos than are the several species of Black Cockatoos. These comprise the largest known species of the family, and some of them are very handsome, the dense black of the general plumage being relieved by brilliant scarlet bars across the tail; or yellow, or scarlet and yellow, or by yellow markings upon the body plumage. None of the black-coloured species are so commonly seen as the white birds, and there is a popular notion that their presence foretells rain, but the writer's observations by no means confirm the statement.

The exquisite beauty of the paroquets of the country is beyond description and it is useless attempting to depict it by words. To the immigrant, fond of ornithology, the field that opens up before him as he lands in this colony is one of beauty and interest, the *psittacidæ* alone being a theme of study worthy of a life-time. Among them are the elegant polytelis, the gorgeous lories and platycerci, which last named genus includes those beautiful and common birds the Rose-bill paroquets. The grass-paroquets are the personification of elegant, grace, and beauty; one little species, the warbling grass-paroquet, which the reader may doubtless have seen in the bird shops of London, under the name of "love birds," the writer has frequently met with in countless thousands, nesting among the stunted eucalypts of the interior level country.

RASORES.

This order of birds would be sparingly represented in Australia were it not for the PIGEONS, family *Columbidæ*. Of these there are over twenty species, the great majority of which are to be found in Queensland. They are everywhere, in the forests, in the scrubs, and on the far inland plains. The fruit-pigeons of the scrubs vie with the parrots in the superb colouring of their plumage and the beautiful metallic and varying hues of these colours. The species that frequent

the interior plains, or that seek their food upon the ground, are of more sombre appearance, as befits their exposed habitats. These species exist in incredible numbers upon the interior plains of Queensland; they are gregarious except at the breeding season, and are much preyed upon by hawks, dingos, and the natives. The Bronze-wings of the forest land are greatly sought after by the sportsman, as they are exceedingly delicate eating. All the species are considered as game, and are a frequent dish upon the tables of the settler. There are several species of small doves, which are as elegant in form, graceful in manner, and beautiful in their plumage as the well-known turtle-dove of Europe.

This order of birds also embraces that curious family the *Megapodidæ*, the nesting habits of which are so extraordinary. The Queensland representative is the WATTLED TALEGALLUS (*T. Lathamii*). The settler upon the coast lands of the colony is certain to come across it, for it is the "wild turkey" of the colonists, and is constantly in demand for the table. It is one of the anomalies of the animal life of Australia, so much so that it has puzzled naturalists in what family to place it. In size the bird is about that of a small turkey, and in appearance very similar, the wattles of the head and neck adding greatly to this similarity. Its colour is blackish-brown. The most remarkable circumstance connected with the bird is that the eggs are not incubated in the manner of other birds, but are deposited two or three feet deep in mounds of earth and vegetable matter. These heaps are often truly gigantic when considered as the work of birds, for the writer has seen them eight feet high by a circumference of even sixty feet. They are constructed in dense scrub, and the method adopted by the bird is to grasp a foot-full of material and throw it backwards as if kicking. The muscles of their legs are very strongly developed, and when kept in captivity the birds are incessantly throwing material from one end of their yard to the other. The same mounds are used year after year, only some fresh material is annually added. When the laying season commences the birds scratch out holes in this mound and deposit the egg, large end up, at the bottom; fresh decaying vegetable matter is then added and the egg left to chance. In due time the young bird is hatched fully developed, works its own way out, and is perfectly able to take care of itself. As the scrubs get cleared these birds will become scarce, but there is no reason why they should not become an addition to our domesticated poultry.

QUAILS are also common game birds of the country, and are universally distributed. In scientific eyes there is only one true quail, the other species being of a genus more allied to the partridge. Whoever is fond of shooting, can, if living near plains or cultivated fields, always have a days' sport, provided a good dog can be obtained, otherwise the birds lie so close that they will only rise when the sportsman is close upon them.

The EMU (*dromaius novæ-hollandiæ*) is the largest of Australian birds, and is so well known both in Britain and in the colonies that description is unnecessary. It is not equal in size to the ostrich, nor

is it as graceful in its movements and appearance, neither are the feathers of any value. The settler is not likely to see the birds in a state of nature unless he travels into the far interior plains. As settlement progresses they are bound to become extinct. The eggs are large, about six inches in length, and are of a beautiful dark green colour; they are laid in a shallow cavity in sandy soil, and both parents take part in incubating them.

Queensland also possesses the CASSOWARY (*casuarius Australis*), a bird which is only second to the emu in size and ostrich-like appearance. It is an inhabitant of the scrubs of the extreme north. When erect the bird will stand about five feet high; the head is bare of feathers, but covered with a bright-blue skin and is surmounted by a helmet of horn of a bright red colour. The bird is not common, and in all probability will soon share the fate of all large wild animals and birds—namely, extinction.

Another of the large game birds of the colony is the AUSTRALIAN BUSTARD (*choriotis australis*) commonly called the Plain Turkey. These birds have a very stately air as they walk the plains; they attain to a height of three feet to the top of the head from the ground. The male will often weigh as much as fifteen pounds, but the female is considerably smaller. Yearling birds are excellent for the table. The birds are seldom shot, except the shooter be on the back of a horse or in a vehicle, for it is next to impossible for a foot-sportsman to get within gunrange. As they only lay one or (sometimes) two eggs, and that only once a year, they also bid fair to be eventually exterminated.

Of PLOVERS, DOTTRELS, SANDPIPERS, and CURLEWS, there are many species to be found in the colony, and there is also a SNIPE, almost identical with that of Europe. The Curlew is noted for the particularly mournful wail which it gives voice to at night time. The Whimbrel is found all along the shores and bays, and is as noisy in the day time as the curlew is at night. Of the Ibis there are several species, including the well-known Sacred Ibis of Egypt. The gigantic Jabiru, which is to be found on the marshes and lagoons, is a noble bird, in appearance like a crane, and which, when walking erect, measures fully five feet in height.

The ARDEIDÆ or Herons, as also the Egrets and Spoonbills are of many species, and are very commonly distributed. In colour they vary from pure white to delicate nankeen-brown, and from grey to black. Many are adorned with elegant head plumes, and their snow-white plumage, and statuestic forms, as they stand knee-deep in the water, make quite a prominent feature in the water-side scenes of this country.

NATATOIRES.

Of the birds of this order the immigrant will see many, for he will be constantly coming across ducks, geese, pelicans, and the black swan, while upon every water-hole he will be sure to see some one of the many species of cormorants and grebes.

The AUSTRALIAN WILD DUCK (*anas superciliosa*), and also the TEAL (*a. punctata*) are universally distributed over the whole of the continent, either inland or along the sea shores. They are both considered excellent eating, and are consequently much sought after by sportsmen. They are now protected in all the colonies during the breeding season; a wise precaution, for the keenness with which they were sought after was fast leading to a diminution of their numbers. There are several other species of ducks, some of which are individually of excessive numbers. Two or three species of the Wild Goose are to be found in Queensland, and they also are hunted for the table. Individually they are not nearly so numerous as the ducks, but they are gregarious, and at certain seasons flocks of great numbers are seen.

The BLACK SWAN (*chenopsis atrata*) is peculiarly an Australian bird. One time the *rara avis* of the world, it is here common to bay and marsh. The black plumage and musical voice attract attention from afar, and the settler is sure, sooner or later, to have the pleasure of seeing it. Easily tamed; these birds are to be seen on the ornamental waters of our public parks and gardens. They are considered game, but require the skill of a good cook to make them truly enjoyable.

Another large bird, which will be seen frequenting the same feeding grounds as the Swan, is the Pelican (*pellicanus conspicillatus*.) This is a truly noble bird, fully equal to the European species in size, and is shot for the sake of the skin, which, when properly cured, makes excellent muffs and tippets. These birds are found in large flocks upon the sea-side, bays, and creeks, and in companies of from a dozen to twenty upon the far interior water holes of the river-beds. In these latter places they are exceedingly destructive to fish, and they also prey largely upon the mussels and crayfish.

Along the sea shores, and over the bays, inlets, seas and oceans that surround Australia are to be found many species of Gulls, Terns, Gannets, Petrels, Albatrosses, and Frigate-birds. These I cannot attempt in this essay even to name.

Enough has been written to show the immigrant what a vast field there is before him if his inclinations lead towards the study of ornithology. He will notice that the old world forms are represented in this southern and most ancient of the earth's countries by species analagous, but seldom identical. The student of development will have a fresh and extensive field for following out the why and the wherefore of the anomalous forms, the peculiar habits, the remarkable nidification, and the extreme beauty and variations of the species and genera. He will, indeed, as mentioned in the introductory chapter of this essay, have before him a book of nature always opening upon a new page.

THE REPTILES.

The reptiles peculiar to Australia are numerous and some of them dangerous to life. The object of this paper is just to mention such as are thus dangerous so that they can be avoided by the immigrant.

The SNAKES have many representative species in Queensland, and the individuals of some of them are very numerous. All our snakes are not venomous, indeed, taking a given number casually seen during the course of several years residence in Queensland, about one half will have been of innocuous species. This fact is mentioned in order to calm the mind of any one who may be bitten, and so prevent undue fear, which may cause a foolish action to be taken, such as chopping off the finger or hand.

One of the commonest snakes of the colony is the Carpet Snake (*morelia variegata*). It is also the largest snake found in Australia, for in Northern Queensland it has been obtained up to twenty feet in length. It has a villainous-looking mouth and set of teeth with which it can bite severely, yet it is non-venomous. It belongs to the Boa-constrictor tribe, inasmuch as it kills its prey by enveloping it in the folds of its long body, and afterwards swallowing it whole. Sooner or later the settler, on the farm or in the country, will be certain to make its acquaintance, for it will find out the fowl-house and commit havoc there. It can be at once recognised by its mottled olive-brown and yellow skin, and its sluggish habits. It will bite severely when wounded. In habit it is nocturnal, but it also sometimes is found travelling during daylight.

The GREEN TREE SNAKE is another very common species in Queensland. It haunts the climbing plants that cover the verandahs of the houses, its object being to prey upon the frogs that live in the spouting and water tanks. It can be recognised by its long thin whip-like appearance, and by the upper parts being a dark olive-brown or green, and sometimes even black, and the under parts more or less yellow. Also, the belly scales are placed flat on the ground, and are not rounded as in terrestrial snakes. In length it reaches six feet. It is amazingly active, and disappears like a flash of light. It is entirely non-venomous, and will bite no one unless injured. There are several species of them, all non-venomous.

The BROWN TREE SNAKE is also non-venomous, but it is of altogether different build and looks ugly enough to be thought dangerous. Its colour is that of a copper-brown above, the belly being salmon-coloured; its length is about six feet, but its thickness through the body is fully twice that of the green snakes, for it will sometimes measure two inches whereas the others seldom exceed one inch. This snake can be recognised by the colour and the shortened tail. Its habits are nocturnal, while those of the green tree-snakes are diurnal. There are several other non-venomous snakes, chiefly of small size; also there are the small blind-snakes, which will be found sometimes when digging the garden, they again are perfectly harmless.

There are two very common and very frequently seen snakes in Queensland, which are deadly venomous, insomuch, that a bite will prove fatal to man or beast unless instant precautions are taken. These two are the Black Snake and the Brown Snake (*pseudechis* and *diemenia*.) There are several species of each of them recognised by the naturalist, but to the ordinary observer they may all be classed

as above. The black snake is intensely black upon the upper side from head to tail, but the belly is sometimes bright red, sometimes salmon-coloured, and again yellow. When alarmed it raises the front third of its body off the ground, bends forward the head which is *flattened*, and is ready to strike certain death upon its enemy. When in this attitude it does not wait to be injured before striking. The flattening of the head is a certain sign of anger, and at once distinguishes the venomous nature of the species, insomuch that none of the non-venomous snakes practice the habit. In length the black snake averages about four to five feet, and in thickness about two to three inches. There is apparently very little neck, that is the head and neck are much of the same thickness, and this again is a distinguishing mark of the venomous from the non-venomous sorts, for the latter have a distinct head joined upon a much narrower neck. The black snake is both diurnal and nocturnal in its habits, and is particularly fond of haunting swamps and river banks, though it is found in all localities. It can swim well, indeed is fond of the water. Always approach it with caution! One blow from a stick will, however, disable it.

The BROWN SNAKE attains to even a greater length and greater thickness than the black snake. Its average length on the coast lands is about five to six feet, but upon the interior western plains it is frequently met with eight feet in length. In young specimens the belly is yellow-spotted, but in aged individuals these disappear, and the whole snake is of a brown colour. In the writer's opinion it is even more deadly in its bite than the black snake, for he has seen strong healthy bullocks succumb in a few hours to its terrible venom. Also he can positively attest that it will sometimes even when unprovoked attack both man and horse. So that a person attempting to kill one must always act with caution. As a rule one sharp blow with a stick or whip will break the vertebræ of any snake, this renders it unable to travel and it can be killed at leisure.

No specific antidote has yet been discovered to the poison of these snakes. There have been many so called discoveries, notably that of Underwood and also of Shires, but both these, when tested by medical experts, proved useless. The only action that can be taken is to tie a ligature tightly round the limb between the bite and the heart, and then to cut the wound so as to make it bleed freely, or to suck it forcibly. Send at once for a medical man and, in the meantime, keep up the depression that will ensue, by frequent drinks of strong spirits of any sort. A man can consume a bottle of spirits in a very short time, if bitten by a venomous species, and yet he will not get drunk. It should always be remembered that to the strong man who is bitten, there is the chance of life if the above precautions are taken; much depends upon whether the snake was extremely angry, as when wounded, or whether merely annoyed, as when touched or trod upon, for the reptile has the power to eject at will, more or less poison; again, the quantity of poison decreases rapidly with every bite. Much also depends upon the state of health

of the bitten person, and whether, through nervousness, he allows fear to overcome him.

The DEATH ADDER (*acanthophis antartica*) is another species which is equally as venomous as the two just mentioned. This snake can be at once recognised by its short length—only about twenty inches—and its breadth in proportion—fully two to three inches—and its peculiarly shortened tail which terminates in a point like a gigantic sting. The danger of the reptile lies in its poison fangs and not in this tail. It is very sluggish, never troubling to move out of the way; it frequents sandy country and is often found under logs when the latter are moved. It is nocturnal in its habits.

The immigrant should remember that, as a rule, if a healthy man is bitten by any snake not thicker in the neck than his little finger that it will not be fatal. If possible obtain the snake that inflicted the bite, it may prove to be a harmless species, and so save from much agony of mind and useless cutting and doctoring. There is one invariable rule by which Australian venomous snakes can be distinguished from the non-venomous. It is this:—Count the lip-scales of the upper lip—if there are only six on each side, of the nasal or front shield or scale, then the snake is venomous; if there are more than six, then the snake is not venomous. The lower lip shields also are only six in the poisonous species, never more, with the single exception of the death adder, which has seven in the lower lip but only six in the upper. This distinguishing mark should be remembered by all. It is only applicable to Australian colubrine snakes and not to the sea-snakes nor to the blind snakes, nor to snakes of other countries.

ALLIGATORS.

The only other reptile dangerous to mankind, found in Queensland, is the Crocodile or Alligator, which is numerous upon all the tropical rivers of the colony that have not been disturbed to too great an extent, by the advent of civilization. As a rule, it is never a safe practice to swim in any tidal stream in the north of the colony. Our alligators do not confine themselves exclusively to tidal waters, the writer having several times seen them attack cattle in waters above the influence of the tide.

There is another and smaller species called *Phyllus Johnsonii*, which is numerous in the upper waters of the rivers that flow into the Gulf of Carpentaria, but this novel species never attacks man or animals, its principal food being fish and sometimes waterfowl.

There are many gigantic lizards—commonly called Iguanas, which are numerous in the colony, but, though diabolical looking, they are all harmless as regards their bite. Turtles of large size are found in all the coastal waters, and small fresh-water species in the interior rivers.

By Authority of the Executive Commissioners in Queensland.



Emigration to Queensland :

OR,

HOW TO GET TO THAT COLONY.

THE Government of the Colony of Queensland, being anxious to induce emigration from Europe so as to develop the numerous resources of their vast colony, and to settle people upon the millions of unoccupied acres of fertile land, have passed an Act of Parliament to assist in many ways those who are willing to try their fortunes in this new land. This paper gives a brief explanation of the Act; so that any one after reading it will know what steps to take in order to reach the colony.

An Agent-General for Emigration to Queensland has been appointed, and the address of his office is—1 Westminster Chambers, Victoria-street, London, S.W. Upon personal application there, full information can be got by the intending emigrant as to conditions required and what money it will cost.

Those persons who are unable to pay the whole cost of their passages may, if approved of by the Agent-General, obtain ASSISTED PASSAGES by paying part of the passage money, provided they have not previously resided in any of the Australian colonies.

But only certain persons are eligible as assisted passengers, and these are—farmers, farm labourers, vine-dressers, labourers, mechanics, and their families, and domestic servants: Provided that the word “labourer” shall be held to mean persons whose labour has been connected in some way with the land, such as farm servants, gardeners, road-makers, miners, quarry-men, navvies, and the like: and such other persons as the Agent-General shall deem eligible. And provided further that the word “mechanic” shall be held to mean and include engineers, engine-fitters, engine-drivers, railway carriage builders, carpenters, bricklayers, stonemasons, blacksmiths, wheelwrights, shipbuilders, and the like.

The Agent-General also has power from time to time, as may be required in the colony, to grant FREE PASSAGES to female domestic servants particularly, and also to other general emigrants as he may approve of; but every such applicant for a free passage will be required to deposit the sum of £1, and a similar amount for each member of his family that he intends to take with him—two children under 12 and over 1 year being counted as a statute adult. Also, the

Agent-General may pay the travelling expenses of such intending emigrants as may be living in any part of the United Kingdom at a distance from the port of embarkation; but in no case shall more than £2 for each adult be given for this purpose.

Upon personal application at the office of the Agent-General, or upon application by letter from any part of the United Kingdom, a schedule (B), similar to the one here presented, will be given to the applicant. A careful perusal of this will explain everything the emigrant has got to do.

SCHEDULE B.

No. 1.

ASSISTED, FREE, OR NOMINATED.

QUEENSLAND.

Register.....

FORM OF APPLICATION.

No.....

This Form, when filled up, is to be separated from the other page and returned as a letter prepaid, addressed to the AGENT-GENERAL for QUEENSLAND, 1 WESTMINSTER CHAMBERS, VICTORIA STREET, LONDON, S.W., who will forward all selected Emigrants in the Ships sailing under his direction for Queensland.

Amount to be paid for		statute adults ...		£	s.	d.	} Total...	£	s.	d.
Amount to be paid for		ship's kits ...								
Name of Party applying for Passage.	Age at last Birthday	Amount to be paid.	County where Born.	Day and Year when born.	State whether Vaccinated or had the Small-pox		Can the Applicant Read and Write: Say "Yes" or "No" opposite name.			
								Read.	Write.	
Trade or Calling of Applicant; and if not now engaged in h original calling, state when ceased to be so employed }										
Place of Residence				Post Town		County				
Street										
If the Applicant has since been employed in any other way than above, state in what way and how long has been so engaged										
Name, Address, and Occupation of some late Employer, and the time the Applicant worked for him										
Name and Address of the Minister of the Parish in which the Applicant resides ... }										
Has Applicant been in the receipt of Parish relief, and, if so, for how long										
Has Applicant been out before to any Colony, and, if so, to which... ..										

I do solemnly and sincerely declare that all the above statements are true; and that I have carefully read or have heard read the directions contained in the paper attached to this form, and that in applying for a Passage to the Colony I am truly acting in accordance with the spirit of those directions, which I understand to be this:—That the privilege of a Passage, if granted, will be allowed me on the faith that I really belong to the classes named; am of good character; have never been convicted of crime, and that I have never previously resided in any of the Australian Colonies; and that I proceed to Queensland, intending to remain there, and not with the view of going to any other Colony; and that, in the event of my obtaining a Passage to the Colony, I hereby undertake to remain in Queensland for at least twelve months from the date of my arrival; and I further declare that I have neither paid, nor agreed to pay, for the purpose of obtaining a passage, any fee or gratuity whatever to, or for the use of, the party through whom this application is made, or anyone else. I also engage to conform to the directions of the appointed Officers, and to such regulations as may be established for the good government and welfare of all during the voyage; and I pledge myself not to leave the ship until she reaches her destination.

Signature of Applicant:

This margin must not be cut away.

It is particularly requested that no one will sign these Certificates unless convinced of the truth of their statements.

CERTIFICATE TO BE SIGNED BY PRESENT OR LATE EMPLOYER.

I CERTIFY that _____, now residing at _____, has been employed by me for a period of _____ months, in the capacity of _____, and that I believe _____ to be competent in _____ calling, and to be a person of unexceptionable character, never to my knowledge having been convicted of crime.

Signature: _____ Residence: _____ Post Town: _____

CERTIFICATE OF A PHYSICIAN OR SURGEON.

I CERTIFY that I have examined the above named applicant, _____, and that _____ is of sound bodily and mental health, and is not afflicted with any disease calculated to shorten life or to impair physical or mental energy. I certify also that _____ has had the small-pox or has been vaccinated, and is entirely free from any disease usually considered infectious or contagious, and that _____ is capable of labour in _____ calling.

Signature: _____ Residence: _____

N.B.—Any free, assisted, or nominated emigrant who obtains a passage and arrives in Queensland with the intention of immediately proceeding to another colony, will be deemed to be guilty of a misdemeanor, and be liable, on conviction, to twelve months' imprisonment. Leaving or attempting to leave the colony within three months after arrival will be considered as prima facie evidence of the intention.

**** This paper must be kept clean, and will be returned unless filled up exactly according to the directions given above. Nothing additional must be written on the form; any remarks the applicant wishes to make must be by letter. No erasures or mutilations must be made.*

Queensland Government Emigration Offices,
London.

Issued

, 188

This Half-sheet to be kept by the applicant.

ASSISTED OR FREE.

QUEENSLAND GOVERNMENT EMIGRATION OFFICES, LONDON.

DIRECTIONS TO BE OBSERVED BY PERSONS WANTING FREE OR ASSISTED PASSAGES TO QUEENSLAND, AND THE CONDITIONS ON WHICH THE PASSAGE WHEN GRANTED MUST BE UNDERSTOOD TO BE ACCEPTED.

DESCRIPTION OF PERSONS ELIGIBLE.

1. The Queensland Government grant passages to persons eligible as to occupation, and passed at the Queensland Government Emigration Office, on the payment, per adult, of the amount mentioned at the bottom of first page; two children of twelve months, and under twelve years of age, counting as one adult.

2. The class of persons eligible are Domestic Servants, Farmers, Farm Labourers, Vine Dressers, Labourers, and Mechanics, and their families. By "Labourers," is to be understood those whose labour has been connected in some way with the land, such as farm-servants, gardeners, road-makers, miners, quarrymen, navvies, and the like, and such other persons as the Agent-General, with the authority of the Government of the Colony, deems eligible. By "Mechanics," such as engineers, engine-fitters, engine-drivers, railway carriage builders, carpenters, bricklayers, stonemasons, blacksmiths, wheelwrights, shipbuilders, and the like.

3. All the Adults must be capable of labour. The candidates most acceptable are young married couples without children, families with a large proportion of daughters over 14 years of age, and female domestic servants of good character.

4. The separation of husbands and wives, of the parents from children under 15, will in no case be allowed.

5. Single women cannot be taken without their parents, unless they go under the immediate care of some respectable married couple, or are willing to be placed under the care of the person appointed as Matron on board the ship.

6. No persons, whether Adults or Children, can be accepted unless they have been vaccinated or have had the small-pox.

7. No applicant will be accepted without decisive certificates of good character and of efficiency in his professed trade or calling.

 Certificates of Marriage will be required, also extract of the Register of Birth or the Certificate of Baptism, *specifying the age*, for any children under twelve years; or if these cannot be procured, a declaration of age signed before a magistrate and witnessed by him, *and these must be sent up with the Form, all the spaces being carefully filled up exactly in accordance with these directions.* Declaring Forms for age of children may be obtained at the Queensland Government Emigration Office, No. 1, Westminster Chambers, Victoria Street, London, S.W.; but the Declaration Form must not be used except in cases where the Register of Birth or Certificate of Baptism, specifying the age, cannot be procured.

APPLICATION AND APPROVAL.

8. Applications must be made in the Form annexed, which must be duly filled up and attested, as explained in the Form itself, and then forwarded to the Queensland Government Emigration Office with an intimation of the probable date it will be convenient for the applicants to embark. *The Certificates of Birth and Marriage, as above explained, to be sent with the Form.*

9. *It must be distinctly understood that the filling up the Form confers no claim to a passage unless the candidates are deemed desirable for the Colony and can be accepted consistently with the shipping arrangements at the time the application is made.*

10. If approved of, the Applicants will receive a passage as soon as arrangements will admit. *But no preparation must on any account be made by the Applicants, either by withdrawing from employment or otherwise, until they have received answers stating that they are accepted,* and have also received notice of the ship in which they are to embark and of the time and place of joining her.

11. Should it be found that any of the signatures attached to the Certificates are not genuine or that any other deception is attempted, the application will be rejected; or should anyone, on personal examination at the Port of Embarkation or on board, be discovered to have made any mis-statement whatever with regard to age, trade or calling, health, &c., such person will not be allowed to proceed in the ship. To prevent disappointment, therefore, Applicants should be very careful to have their trade or calling and ages correctly stated in their Application Form.

SUBSEQUENT PROCEEDINGS.

12. If after the arrival at the port of embarkation of persons receiving these passages, they or any of their family are found not to be in a fit state of health to embark, or have any mental or bodily defect likely to impair their usefulness as labourers, or to have left any of their young children behind, or to have brought with them more children than are mentioned in their application form, they cannot be received on board the ship; or, if embarked, must be landed again without having any claim for a passage.

13. If any persons fail to attend at the appointed time and place for embarkation, or to proceed in the ship, or are rejected for any of the reasons specified in the preceding directions, they will not be able to claim a passage by any future ship.

14. Provisions and Medical Attendance will be supplied by the ship. Persons must bring their own clothing, which will be inspected at the Port by an Officer; and all parties are particularly desired to observe that they will not be allowed to embark unless they provide themselves with a sufficient supply for the voyage. The lowest quantity that can be admitted for each adult is as follows:—

OUTFIT OF CLOTHING.

For Males.

Six shirts
Six pairs of stockings
Two warm flannel or Guernsey shirts
Two pairs of strong shoes
Two complete suits of strong exterior clothing.

For Females.

Six shifts
Two warm and strong flannel petticoats
Six pairs of stockings
Two pairs of strong shoes
Two strong gowns, one of which must be warm.

But for each child nine shirts or shifts, four warm flannel waistcoats, and one warm cloak or outside coat, six pairs of stockings, two pairs of strong shoes, and two complete suits of exterior clothing, are required. In the case of emigrants proceeding to the Colony by the Torres Straits mail steamers this outfit may be varied at the option of the Agent-General.

15. The articles contained in either of the subjoined lists must be also paid for by persons receiving these passages, but will be supplied to them on their joining the ship. For this purpose they will be required to send up the money

named at the top of this schedule, making in all £ , to the Queensland Government Emigration Office, on the following scale for each adult :—

Outfit for 20s.

1 Bed and pillow	...	...	...	...	...	...	} 20s.
1 Pair blankets	...	...	...	...	...	...	
1 Do. sheets	...	...	...	...	...	...	
1 Counterpane	...	...	...	...	...	...	
1 Water bottle	...	...	...	...	...	...	
1 Wash basin	...	...	...	...	...	...	
1 Plate	...	...	...	...	...	...	
1 Pint drinking mug	...	...	...	...	...	...	
1 Quart do. do.	...	...	...	...	...	...	
1 Knife and fork	...	...	...	...	...	...	
2 Spoons	...	...	...	...	...	...	}
3 lbs. soap	...	...	...	...	...	...	
1 Slop pail	...	...	...	...	...	...	

These things, together with the necessary brushes and combs and clothes-brushes, for cleanliness, must be provided also by persons receiving these passages. They must not have less than the above outfit, but the larger the stock of clothing the better for health and comfort during the voyage, which usually lasts three or four months, and as the voyagers have always to pass through very hot and very cold weather, they should be prepared for both. Two or three coloured serge shirts for men, and an extra supply of flannel for women and children, are strongly recommended.

16. It is desirable that parties should take out with them the necessary tools of their trade. Bulky agricultural implements, however, cannot be admitted on account of their inconvenience, size, and weight; neither can furniture be received on board. Feather beds are especially prohibited.

17. The whole quantity of baggage for each adult person must not measure more than 20 cubic or solid feet, nor exceed half a ton in weight. It must be divided into two or three boxes, the contents of which must be closely packed, so as to save space in the ship, and the owner's name should be legibly painted thereon with white paint. Large packages and extra baggage will not be taken unless paid for, and then only in case there be room in the ship.

18. Each family will be allowed to take only its own luggage. Any violation of this rule will subject the party to a forfeiture of his passage.

19. On arrival in the Colony all passengers, unless going out under special agreement, will be at perfect liberty to engage themselves to any one willing to employ them, and to make their own bargain for wages. They will be expected strictly to observe on board the regulations framed with a view to their health and comfort during the voyage.

Any person wishing to emigrate to friends who are already settled in Queensland can do so in another way to that which has been just mentioned. That is, they can get any friend or relation in the colony to NOMINATE THEM FOR A PASSAGE. It is done in this way—The relation or friend in Queensland applies to the local Emigration Agent for a passage, and at the same time deposits money as per the following scale for each :—

Person Nominated.

Sex.	Between one and twelve years.	Between twelve and forty.	Above forty and under fifty-five.
	£	£	£
Male	1	2	4
Female	1	1	4

55 is the limit of age, after that must be full payers.

Whereupon he gets a passage warrant, available for twelve months, which he forwards to the friend or relation in England, who shall produce the same to the Agent-General, and then exactly the same course must be pursued as in the case of the assisted or free emigrant.

On arrival in the colony emigrants are housed in the Immigration Depôt until they have had time to make a hiring agreement. Such depôts are found at various of the coast towns of the colony, so that if an emigrant wishes to stay at any particular town he has only to mention it to the authorities when applying for a passage. It must distinctly be remembered that the penalty for any assisted, free, or nominated emigrant attempting to leave the colony within three months after arrival is rigidly enforced. But if any emigrant wishes so to leave within three months after his arrival he can do so provided he pay to the local Immigration Agent a sum equal to that contributed by the Government for his passage to the colony.

There is another way in which the Government of Queensland assist the person willing to emigrate, and who has some means of his own. It is commonly called the *Bounty* system. To explain, it is necessary to say that the passage of every emigrant costs the Government of Queensland £17. Now if the emigrant can pay £7 the Government will pay the rest. A very large number of emigrants come out under this clause, the emigrant doubtless having the inward satisfaction of feeling that at any rate he has contributed a fair share towards his support during the voyage. Such emigrants can only sail in the ship chartered by the Agent-General, and they must understand that this part payment of passage does not release them from the duty of conforming to the rules and regulations of the ship, nor from the authority of the surgeon in charge of the emigrants.

It must be distinctly understood that this part payment of the passage money does not give the right to leave the colony, even to one of the other Australian colonies, until after a residence in Queensland of three months.

Many persons anxious to emigrate to this colony, and who are able to pay their full passage money prefer to make the voyage in one of the ships chartered by the Agent-General for emigration to Queensland, because such a fact is a guarantee that all conduct on board will be orderly, and that discipline will be maintained, and that the comfort and health of the passengers will be properly attended to. Any

person, however, who sails in one of these chartered vessels must comply with all the rules as laid down for the conduct of the ship, and must take his place with the rest in the duties allotted by the Surgeon Superintendent. The fact of having paid the whole of the passage money is no excuse for exemption from such duties.

No ships other than first-class steamers are now chartered to bring emigrants to Queensland: These all pass through the Suez Canal, thus the voyage is shortened to the term of about six weeks, a fine being inflicted for every day's delay beyond contract time. The voyage through the Mediterranean, and afterwards through the Indian Ocean and Torres Straits, is generally quite a "summer weather" one, and thus the emigrant is saved the dangers, and cold storms of the old route to Australia by the great southern ocean, and which voyage instead of only occupying six weeks, as is now the case, frequently took from four to six months.

COLONIAL & INDIAN EXHIBITION OF 1886.

BY AUTHORITY OF THE EXECUTIVE COMMISSIONERS IN QUEENSLAND.



HOW TO SETTLE

ON THE LAND

IN THE

COLONY OF QUEENSLAND.

BRISBANE:

WARWICK AND SAPSFORD, PRINTERS AND LITHOGRAPHERS, EAGLE STREET.

1886.

HOW TO SETTLE ON THE LAND IN THE COLONY OF QUEENSLAND.

HOW TO GET A FARM IN THE COLONY OF QUEENSLAND.

At the present time, 1886, there are 416,646,946 acres of land in Queensland which belong to the Crown. The greater part of these are leased in the form of extensive runs or blocks, commonly called squattages, to tenants, who simply use them for grazing sheep and cattle. The Parliament of the colony, during the Session of 1884, passed a LAND ACT which resumed one-half of each of these squatting runs in all but the extreme west and northern portions of the colony. The object of this resumption was to encourage closer settlement by resident pastoral tenants, and by freehold farmers. This paper will point out to the emigrant from Europe sufficient of the provisions of this Land Act to instruct him how to get Land; what area he can lease; what area he can purchase; the price he will have to pay, and conditions he will have to comply with.

The wide range of choice the Act affords is apparent when it is stated that the emigrant can lease for thirty years tenure 2500 acres, and up to 20,000 acres of grazing land; or he can lease for fifty years, with the option of purchasing after ten years occupancy, a farm of from 320 acres up to 1280 acres; or he can take a farm of not more than 160 acres, and obtain a freehold deed for it in five years' time, by paying only 6d. per acre per year.

HOW A LEASEHOLD OR GRAZING FARM CAN BE GOT.

From time to time certain large tracts of country are proclaimed AREAS open for selection. This is always publicly proclaimed one month prior to any selections being allotted. These areas are always surveyed into lots of various sizes (due regard being observed as to whether the land is only suitable for grazing purposes or for cultivation); proper roads are left for easy access, and so are reserves for future public use.

The proclamation always states whether the land is called an AGRICULTURAL AREA or a GRAZING AREA. If agricultural, then the greatest amount that can be selected shall not exceed 1280 acres by one applicant; nor shall a less quantity than 320 acres be taken. If it is

not an agricultural area, then it is a grazing area, and the quantity that can be selected shall not be less than 2560 acres, nor more than 20,000 acres. The annual rent to be paid for each lot is stated in the proclamation; this, in the case of agricultural land, is never less than threepence per acre, and in the case of grazing lands, not less than three farthings per acre. At the same time it is always stated at what price the tenant has the option of purchase of agricultural land according to conditions stated in another paragraph. Maps of these areas are always exhibited at the local land office, and at the Land Office at Brisbane; and at these offices any information is willingly given to inquirers.

Any person can select land who is over 18 years of age, except married women not having judicial separation; but a woman protecting her own property can select. An application form is given to the inquirer at the Land Office, and he then states upon it which lot he applies for, and at the same time lodges the amount of the first year's rent, and the survey fee. The owner of the first application lodged gets the land; but if two or more applicants are at the office at the same time, then the right of application is decided by lot. In due time the applicant gets notice that his application has been accepted, and he receives a license to occupy the land. This license is not transferable.

The conditions upon which this license is granted are as follow:— In the case of Grazing farms, the selector must, within three years, enclose the land with a good and substantial fence. In the case of Agricultural farms, the selector must, within five years, either enclose the land with a good substantial fence, or make improvements on the land equal to the cost of such a fence. Having effected these improvements the selector applies for his certificate of having done so, and an inspector is sent to report upon them, and if the report is favourable the Land Board grant the certificate, and the selector is entitled to his LEASE.

The conditions of the lease are:—

The term of the lease shall in the case of an Agricultural farm be fifty (50) years, and in the case of a grazing farm be thirty (30) years.

The annual rent of either class of farm shall, for the first ten years, be the rent specified by the Proclamation declaring the land open for selection. The rent for each period of five years afterwards shall be determined by the Land Board.

If the rent is not paid upon the day it is due (31st March), then the lease is forfeited; but forfeiture can be set aside if a fine of fifteen per centum is paid, in addition to the amount due, within ninety days. If not paid by then, the lease is absolutely forfeited.

The lessee shall occupy the land continuously and *bonâ fide* during the term of the lease; but he can, if he like, appoint some other person to reside for him, and every such appointment of bailiff shall be

registered at the Lands Office, otherwise the appointment will not be recognised.

In the case of a Grazing farm, the lessee shall keep the land fenced during the whole term of lease.

HOW A FREEHOLD OF 1280 ACRES CAN BE GOT.

The selector of any holding in an Agricultural area can purchase his land after having himself resided upon it for ten (10) years, including the application for purchase, and after having duly complied with the other conditions. The purchase money is that announced by the Proclamation which declared the land open for selection. If not purchased within the first twelve years, then the money to be paid is somewhat greater. In case of the death of the lessee, then the residence of someone beneficially interested is sufficient for compliance with that clause requiring personal residence. It must be remembered that under this clause no one can select and make freehold a greater area than 1280 acres. If not made freehold, then the lease of these agricultural farms extends to 50 years.

HOW A FARM OF 160 ACRES CAN BE GOT.

There are in the Land Act special provisions for acquiring freeholds in the case of holdings not exceeding 160 acres and after personal occupation. They are these:—The selector must expend ten (10) shillings per acre in substantial improvements upon the land, and *must reside personally bonâ fide on the land continuously for five years*. Then if he has duly paid the rent he is entitled to get his deeds of the land. The price he will have to pay will *only be half-a-crown per acre* altogether—that is, if the sum he has paid in rent has not amounted to 2s. 6d. per acre during the five years; then he must pay up sufficient to make it so; but if his rent has been classed higher than 6d. per acre so that during the five years of residence he has paid more than half-a-crown per acre, then the overplus is refunded to him.

It will thus be seen that the farmer who will be content with 160 acres or less, and intends to make it his home, can, by this liberal Land Act, obtain such a farm by paying the small sum of 6d. per acre per year for only five years! Only first-class farming land is surveyed into these small areas, so that the selector is certain to have obtained land of the very best quality in the district. The expenditure of ten shillings per acre required is no more than any settler must perforce spend in putting up his hut, yards, out-sheds, fences, etc. A settler need not confine all his personal work to his own land. He can work for wages elsewhere on adjoining plantations or farms, take contracts for supplying timber, or cartage, etc; but he must have his *bonâ fide* house on the selection. If his wife and family do not reside there, then he must return to his home to sleep so frequently that there can be no possible loophole for any one to say he has not used his land as his homestead.

It will thus be seen that the immigrant into Queensland actually requires no capital to select one of these small farms, provided he does so in a neighbourhood where he can get work to live by, so as to obtain money to spend upon his farm. The climate of Queensland is so genial that the first twelve months may safely and healthily be passed in a tent, or in the roughest of bark huts, while at odd times a better one is being built.

There are clauses in the Land Act which in some cases allow of selection before survey has taken place, but these the settler can better understand after a residence in the colony.

HOW A FARM OF 100 ACRES CAN BE GOT.

There are in the Land Act special provisions for acquiring freehold in the case of holdings not exceeding 100 acres and after payment of a certain sum. These are:—(1) The selector must expend £50 (50 shillings) on the land. (2) The selector must be a resident in the colony for five years. (3) The selector must be a British subject or the wife of a British subject. (4) The selector must be a resident in the colony for five years. (5) The selector must be a resident in the colony for five years. (6) The selector must be a resident in the colony for five years. (7) The selector must be a resident in the colony for five years. (8) The selector must be a resident in the colony for five years. (9) The selector must be a resident in the colony for five years. (10) The selector must be a resident in the colony for five years. (11) The selector must be a resident in the colony for five years. (12) The selector must be a resident in the colony for five years. 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